

# MADROÑO

A WEST AMERICAN JOURNAL OF  
BOTANY



## Contents

PROTOCOLONOSPORA ON PHORADENDRON FLAVESCENS IN CALIFORNIA, <i>Louise Darling</i> .....	241
TWO NEW COMPOSITAE FROM THE WALLOWA MOUNTAINS OF OREGON, <i>Morton E. Peck</i> .....	247
PINUS MURICATA AND CUPRESSUS FORBESII IN BAJA CALIFORNIA, <i>Carl Epling and William Robison</i> .....	248
A REVISION OF THE GENUS MONOLOPIA, <i>Ethel Crum</i> .....	250
REVIEW: Cooke, <i>Flora of Mount Shasta</i> (Lincoln Constance) .....	270
NOTES AND NEWS: <i>Mistletoe on Persimmon</i> (Ira J. Condit); <i>A New Locality for Salvia eremostachya Jepson</i> (Carl Epling); <i>News</i> .....	272
PROCEEDINGS OF THE CALIFORNIA BOTANICAL SOCIETY .....	273
INDEX .....	274

Published at North Queen Street and McGovern Avenue, Lancaster,  
Pennsylvania

October, 1940

# MADROÑO

## A WEST AMERICAN JOURNAL OF BOTANY

### Board of Editors

DR. H. L. MASON, University of California, Berkeley, Chairman.  
DR. L. R. ABBAMS, Stanford University, California.  
DR. LINCOLN CONSTANCE, University of California, Berkeley.  
DR. H. F. COPELAND, Sacramento Junior College, Sacramento, California.  
DR. A. W. HAUPT, University of California at Los Angeles.

Secretary, Editorial Board—ETHEL CRUM  
Department of Botany, University of California, Berkeley  
Business Manager—DR. DAVID D. KECK  
North Queen Street and McGovern Avenue, Lancaster, Pennsylvania  
or  
Carnegie Institution of Washington  
Stanford University, California

Entered as second-class matter October 1, 1935, at the post office at Lancaster, Pa., under the act of March 3, 1879.

Established 1916. Published quarterly. Subscription Price \$2.50 per year. Volume I, Numbers 1 to 17, complete, \$5.00. Volume II, Numbers 1 to 17, complete, \$5.00. Volume III, Numbers 1 to 8, complete, \$5.00. Single numbers \$0.75.

Papers up to 15 or 20 pages are acceptable. Longer contributions may be accepted if the excess costs of printing and illustration are borne by the contributor. Range extensions and similar notes will be published in condensed form with a suitable title under the general heading "Notes and News." Articles may be submitted to any member of the editorial board. Manuscripts may be included in the forthcoming issue provided that the contributor pay the cost of the pages added to the issue to accommodate his article. Reprints of any article are furnished at a cost of 4 pages, 50 copies \$3.70; 100 copies \$4.10; additional 100's .75¢; 8 pages, 50 copies \$5.40; 100 copies \$6.00, additional 100's \$1.20. Covers, 50 for \$2.50; additional covers at \$1.50 per hundred. Reprints should be ordered when page proofs are returned.

Published at North Queen Street and McGovern Avenue, Lancaster, Pennsylvania, for the

### CALIFORNIA BOTANICAL SOCIETY, INC.

President: Dr. Ira L. Wiggins, Stanford University, California. First Vice-President: Dr. G. Ledyard Stebbins, Jr., University of California, Berkeley. Second Vice-President: Dr. Carl Epling, University of California, Los Angeles. Treasurer: Dr. David D. Keck, Carnegie Institution of Washington, Stanford University, California. Secretary: Dr. Lincoln Constance, 4004 Life Sciences Building, University of California, Berkeley.

Annual membership dues of the California Botanical Society are \$2.50, \$2.00 of which is for a year's subscription to Madroño. Dues should be remitted to the Treasurer. General correspondence and applications for membership should be addressed to the Secretary.



PROTOCOLONOSPORA ON PHORADENDRON  
FLAVESCENS IN CALIFORNIA

LOUISE DARLING

In the spring of 1928 a new disease of the mistletoe, *Phoradendron flavescens* (Pursh) Nutt. var. *macrophyllum* Engelm. was reported as occurring on mistletoe plants parasitic on willows and poplars growing on the northwest shore of Clear Lake in Lake County, California. Several collections have since been made, but all in this same general locality. The disease has never been noted elsewhere in California, nor has any other record of it been found.

The infection, at first noticeable on the *Phoradendron* leaves as small brown spots 2 to 5 mm. in diameter, later becomes confluent involving the greater part of the leaf (text fig. 1). Stem lesions are smaller, averaging 1 mm. in diameter, but very closely grouped together. In time the infecting organism completely kills its host and fruits abundantly over the surface of the dead leaves and stems. The fruiting bodies are in the form of dark erumpent sori containing masses of spores. The organism causing the disease was at first thought to belong to the genus *Gloeosporium* because of the type of acervuli formed and the manner in which the spore masses oozed from them. An examination of the spore bearing structures, however, showed it to be an undescribed species of the genus *Protocoronospora*.

The genus *Protocoronospora* was first described by Atkinson and Edgerton (Jour. Mycol. 13: 185-186. 1907) as causing a disease of cultivated vetch. These two investigators tentatively placed the new genus close to *Corticium* in the Thelephoraceae because it appeared to produce basidia in a definite hymenium seated on a pseudo-parenchymatous subhymenium. The budding of spores on germination from one or both ends was taken as an additional character indicating basidiomycete relationship. The new genus suggested affinity with *Exobasidium* also in that conidiophores, similar in shape but shorter and more slender than the basidia, were borne in the same hymenium intermingled with the basidia. The conidia resembled basidiospores in shape and size and both were sessile, borne in terminal whorls which were repeatedly replaced.

Wolf, however, in a later and more comprehensive study (Jour. Elisha Mitchell Sci. Soc. 36: 72-84. 1920) of the same organism, *Protocoronospora nigricans*, found characters which definitely removed it from the Thelephoraceae to the Melanconiaceae of the Fungi Imperfecti. His chief basis for the change in position of the genus was the multinucleate condition in all parts of the fungus: nutritive mycelium, stroma, conidio-

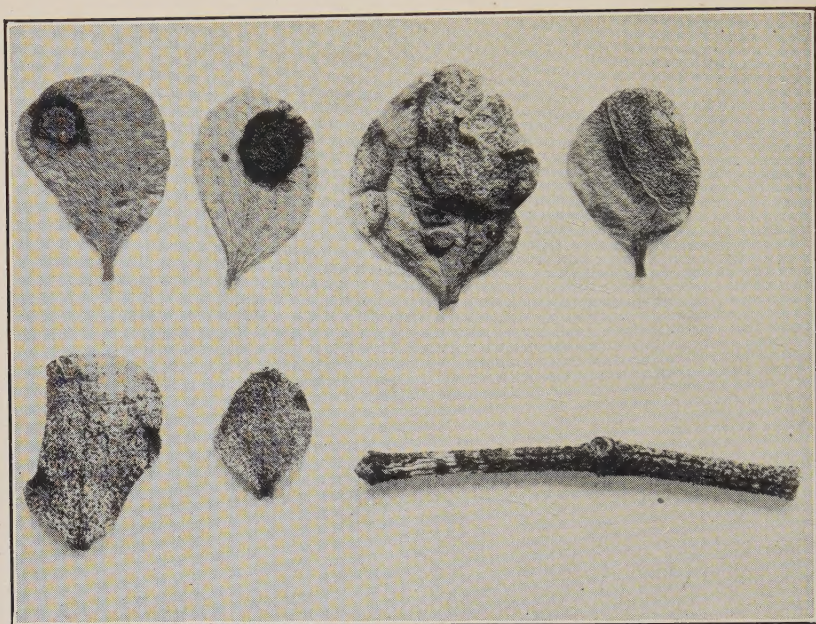


FIG. 1. Leaves and stems of *Phoradendron flavescens* var. *macrophyllum* infected with *Protocoronospora Phoradendri*. The leaves are arranged to show progressive stages in the development of the disease. Collected on *Salix laevigata*, north shore of Clear Lake, Lake County, California.  $\times 0.8$ .

phores, and conidia. The conidiophores are of varied size, and range from slender, nearly cylindrical to clavate; hence Atkinson's and Edgerton's interpretation of basidia and conidiophores making up the hymenium. A second point of importance lay in the fact that the number of spores borne by each conidiophore is indefinite. This is particularly pertinent since the spores may be replaced, as they mature and fall away, by new ones—a condition not associated with basidiomycetes. Also, in place of being formed on well defined sterigmata, the spores are sessile or nearly so. In the Thelephoraceae, the basidia are binucleate in the young stages, and arise from binucleate cells of the subhymenium. The situation prevailing in *Protocoronospora* is not known in any of the basidiomycetes.

*Protocoronospora Phoradendri* sp. nov. In maculis brunneis, primum parvis et distinctis, dein confluentibus, in foliis caulibusque; mycelium intracellulare; acervuli amphigeni, subepidermici, erumpentes; setae multum raras, 30–50  $\mu$  longa, 3–4  $\mu$  diametro, fuscae; conidiophora clavata ad cylindrata, 11–30  $\mu$  longa, 3–9  $\mu$  diametro; conidia ab apicibus aut rarius a lateribus conidiophorum abscissa, 1–9 fere 5 aut 6 simul; sterigmata parvula, ob-



scura, non manifesta dum post conidia fundendum; conidia eburnea in mole, recta ubi juvenia, maximum partem falcata ubi matura, 15–26  $\mu$  longa, 4.5–6.5  $\mu$  diametro; germination a tubulos germinantes producendo.

In brown spots, at first small and distinct, later confluent, on stems and leaves; mycelium intracellular; acervuli amphigenous,

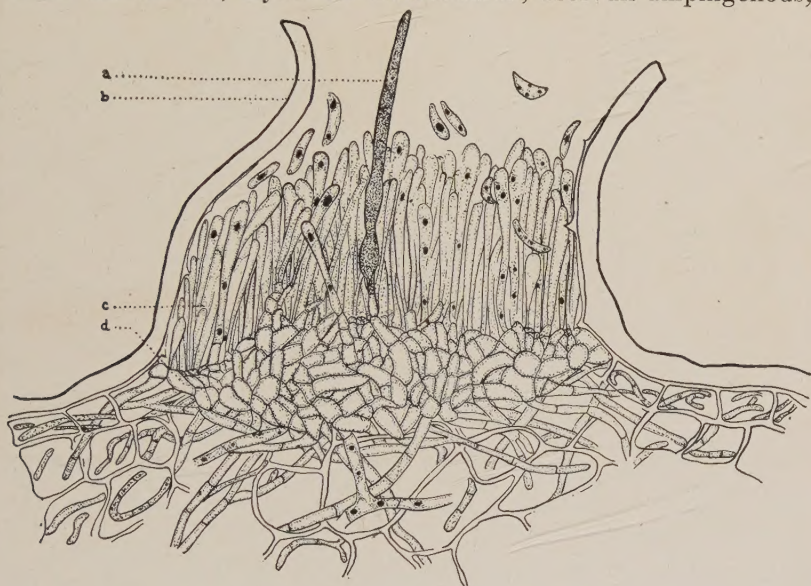


FIG. 2. Young acervulus of *Protocoronospora Phoradendri* on leaf of *Phoradendron flavescens* var. *macrophyllum*: a seta, b cuticle torn from the epidermis by growth of acervulus, c conidiophores, d stroma; drawing semi-diagrammatic,  $\times 146$ .

subepidermal, erumpent; setae exceptionally rare, 30–50 by 3–4 microns, dark brown; conidiophores clavate to cylindrical, 11–30 by 3–9 microns; conidia abstricted from the tips or, more rarely, sides of the conidiophores, 1–9, usually 5 or 6 simultaneously; sterigmata small, obscure, not evident until after shedding of conidia; conidia cream-colored in mass, straight when young, mostly falcate when mature, 15–26 by 4.5–6.5 microns; germination by production of germ tubes only.

Type. On *Phoradendron flavescens* (Pursh) Nutt. var. *macrophyllum* Engelm., north shore of Clear Lake, Lake County, California, March 30, 1934, Lee Bonar (Herb. Univ. Calif. no. 615–587).

The morphology of the infection produced on *Phoradendron flavescens* by *Protocoronospora Phoradendri* was studied in detail. Stained permanent preparations of cross sections of leaves in young and more advanced stages of infection were used to work out the structure and development of the acervuli and for study of the nuclear content of hyphal cells in the nutritive mycelium

as well as in the fruiting structures. Examination of this material showed the following: the fungus is an intracellular parasite although it may pass through intercellular spaces as it ramifies through the host. It is most abundant in the epidermal and sub-

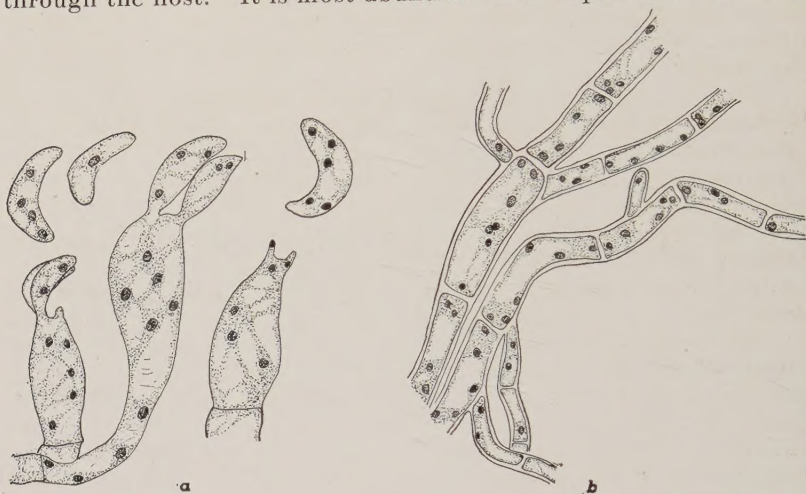


FIG. 3. *Protocoronospora Phoradendri*. a, Conidiophores showing sterigmata and spores; from acervulus developed on Leonian's agar; stained to show multinucleate condition,  $\times 298$ . b, Cells of intracellular mycelium showing multinucleate condition; camera lucida drawing,  $\times 194$ .

epidermal layers and does not invade the vascular tissue. The parasite does not cause distortion in the host cells though the chloroplasts are destroyed with its advance. Hyphal strands in the host cells average 4 to 5 microns in width. Cells with four to six nuclei are common (text fig. 3, b). The mycelium becomes massed at various spots just under the epidermis; there anastomosing strands give rise to a pseudoparenchymatous stroma eventually occupying from two to three layers of host cells. The free ends of stromatic cells form the conidiophores. The force exerted by the growth of stroma and conidiophores raises the epidermis, making a rent in the thick cuticle which is finally pushed back, thus forming a border about the whitish pustule of spores extruded from the mouth of the acervulus. With age the acervulus becomes darkened and the cuticle around it is sloughed off. Mature acervuli vary in size from 150 to 330 microns, with the average around 250 microns. Sometimes two or more may coalesce. The acervuli form on both surfaces of the leaves.

Stock cultures were started from single spore isolations. A modified Leonian's agar<sup>1</sup> and oatmeal agar proved to be the most

Dihydrogen potassium phosphate .....	1.2 gr.
Magnesium sulphate .....	.5 gr.
Agar .....	20. gr.

Glucose .....	6. gr.
Malt extract .....	6. gr.
Distilled water .....	1,000 cc.



suitable media both for mycelial growth and for sporulation. Colonies in culture are characterized by a flat, "wet" type of growth. Often almost as soon as macroscopic colonies are evident on the agar, dark cushion-like centers are developed. These are bordered by a white margin of actively growing hyphae. Zonation is a conspicuous feature in older colonies of this fungus.

Two to three days after conidia have been planted on plates of Leonian's agar, fresh conidia develop as lateral outgrowths from hyphal cells as well as on conidiophores. Spores form as outgrowths of the cells and are abstricted as they enlarge and become curved. Mature spores measuring up to 30 by 8 microns may be found massed about the mycelium and conidiophores. Usually within a week black acervuli of irregular shape develop on the young colonies. Conidiophores and conidia form in great numbers in these structures and ooze forth from the mouths.

The conidiophores in culture show variation in shape although all are of the same general pattern, cylindrical to clavate. They are borne on the tips of the hyphae and often are not differentiated to any extent from other cells in the filament. The conidia are borne in whorls at the tips and occasionally along the upper sides of the conidiophores. The number borne at a time varies from one to eight or nine. They appear to be sessile until after they have fallen away when little sterigmata-like pegs may now and then be seen projecting from the conidiophores. Presumably these little projections grow into new spores which, in turn, when abstricted, leave sterigmata at the base. The conidia are hyaline, granular, thin-walled, multinucleate, sometimes containing guttulae. They cling together in glutinous, cream-colored masses.

Infection experiments were carried on with three species of plants: *Vicia sativa* to which *Protocoronospora nigricans* is extremely destructive, *Phoradendron flavescens* var. *macrophyllum* and *Phoradendron villosum*. Plants were inoculated as follows: (1) by sponging the leaves and stems with a heavy spore suspension and (2) by wounding the tissues with a needle dipped in the spore suspension. Neither *Vicia sativa* nor *Phoradendron villosum* proved susceptible to attack. In the case of *Phoradendron flavescens* var. *macrophyllum*, infection in the form of blackening from 1 to 2 mm. about the wounds showed within eight days. Within forty-three days immature acervuli appeared. The plants which were sponged with spore suspension were not affected. In leaves inoculated through wounding, the incidence of infection was approximately 30 per cent.

For purpose of contrast, specific characters of *Protocoronospora nigricans* and *Protocoronospora Phoradendri* are assembled in the following table. Material used for the study of *Protocoronospora nigricans* was furnished by Dr. Wolf.

TABLE 1. Comparison of *Protocoronospora nigricans* and *Protocoronospora Phoradendri*.

<i>Protocoronospora nigricans</i>	<i>Protocoronospora Phoradendri</i>
<i>Leaf lesions</i> numerous, small, dark brown to black, spots av. 1 mm., or in streaks 1-5 mm. long.	<i>Leaf lesions</i> lighter brown, large, indefinite in shape, becoming confluent over most of leaf.
<i>Stem lesions</i> , black streaks 3 mm. to 3 cm. or more.	<i>Stem lesions</i> small, 1 mm. or less, crowded, coalescent.
<i>Acervuli</i> 55-220 microns diam., av. less than 100 microns, single or clustered, subepidermal, erumpent.	<i>Acervuli</i> 165-330 microns diam., single or clustered, more conspicuously erumpent.
<i>Setae</i> dark brown, tapering, 50-95 by 6-9 microns, abundant on leaves and stems, none on pods; 1-20, av. 6-8 per acervulus.	<i>Setae</i> dark brown, tapering, bulbous base, 30-50 long by 3-4 microns wide above base; very rare on leaf, lacking on stems; 1-10, av. 1-2 per acervulus.
<i>Conidiophores</i> clavate to cylindrical.	<i>Conidiophores</i> clavate to cylindrical.
<i>Conidia</i> straight to slightly curved, continuous, 11-20 (av. 17) by 2.5-3.5 microns, hyaline, pale pink in mass.	<i>Conidia</i> decidedly falcate at maturity, continuous, 15-26 (av. 20-24) by 4.5-6.5 microns, hyaline, creamy white in mass.
<i>Germination</i> of conidia by budding and by germ tubes.	<i>Germination</i> of conidia by germ tubes; no true budding.
<i>Hosts</i> : species of <i>Vicia</i> .	<i>Host</i> : <i>Phoradendron flavescens</i> var. <i>macrophyllum</i> .

These differences are considered of sufficient importance to distinguish the fungus parasitic on mistletoe as a separate species.

The writer is indebted to Dr. Lee Bonar of the Department of Botany, University of California, Berkeley, for his helpful advice and criticism during the course of this study.

Department of Botany  
University of California  
Berkeley, November 27, 1939



TWO NEW COMPOSITAE FROM THE WALLOWA  
MOUNTAINS OF OREGON

MORTON E. PECK

The two plants here described were collected several years ago in one of Oregon's chief centers of endemism, an area which still continues to yield novelties to the collector.

*Cirsium wallowense* sp. nov. Caulis robustus 5-10 dm. altus supra medium late ramosus cano-lanatus; folia 2-4 dm. longa ad basin decurrentia anguste linearia praeter lobos remotos plus minusve 3-fisso, hic 1.5-4 cm. longis apicibus spinis tenuissimis flavis cuspidatis, subter dense tomentosa, supra sparse tomentosa; capitula 1-3 in extremis ramorum longorum; involucrium 4-5 cm. latum vix 3 cm. altum densius arachnoideo-tomentosum, squamis intimis ad apicem rigido-scariosis, exterioribus minus dimidio brevioribus valde patentibus vel squarrosis spinis brevibus armatis, dorso non glanduloso; corollae ochroleucae vel pallide lilaceae apicibus loborum obtusis; anthera abrupte brevi-acuminata.

Stem stout, 5-10 dm. high, widely branched above the middle, closely gray-lanate; leaves 2-4 dm. long, decurrent at base 1-4 cm., narrowly lanceolate to oblanceolate, deeply pinnatifid or pinnatisect, with sometimes rather remote, more or less deeply 3-cleft segments, these 1.5-4 cm. long, the apices tipped with slender yellow spines, the lower surface densely gray-tomentose, the upper more thinly so and somewhat floccose; heads solitary or in twos or threes, mostly at the ends of the long slender ascending branches, without subtending leaves or only 1 or 2 and these very small; involucre 4-5 cm. broad and less than 3 cm. in height, rather densely arachnoid-tomentose, the innermost bracts stiff-scarious and often curled toward the tips, the rest all more than half as long, narrowly lanceolate and long-acuminate, mostly more or less spreading or recurved, none glandular on the back, armed with short weak spines; corollas ochroleucous or pale pinkish, the lobes nearly blunt; anthers abruptly short-acuminate; tips of pappus slightly dilated and minutely scabrous.

Type. Open woods, five miles east of Flora, Wallowa County, Oregon, June 23, 1934, *Peck 18243* (Herb. Willamette Univ.). Additional collection: west slope of the Snake-Imnaha River divide, twenty-three miles above Imnaha, Wallowa County, July 13, 1933, *Peck 17655*.

This species is not very similar to any other known to us. In Oregon at least it is probably confined to the Wallowa region. On the Imnaha-Snake River divide it was noted scattered over a wide area of steep open slopes.

*Taraxacum paucisquamosum* sp. nov. Planta e radice maxima alta; foliis patentibus 4-8 cm. longis oblongis vel late oblanceo-

latis obtusis runcinato-pinnatifidis prope glabris; scapis paucis, 2-6 cm. altis ad apicem tomentosis; capitulis circiter 30-50-floris; involucri 12-16 mm. alto squamis minute bifidis exterioribus patentibus vel reflexis 4-7 mm. longis interioribus 8-10, intimis late lanceolatis; achenis pallide olivaceis ad apicem spinulosis rostro minus bis longiore corpore; pappo flavido-albo.

Plant inconspicuous, from a very deep taproot; leaves few, mostly spreading, 4-8 cm. long, mainly sessile, oblong or broadly oblanceolate, obtuse, shallowly to rather deeply pinnatifid, the segments mostly runcinate, glabrous or with a few scattered hairs; scapes one to several, slender, 2-6 cm. long, tomentose at summit; heads small, about 30-50-flowered; involucre 12-16 mm. high, the bracts mostly minutely bifid at apex with a small dorsal prominence just below, the outer 12-15, usually less than half as long as the inner and spreading or reflexed, oblong or broadly lanceolate, the inner 8-10, in 2 series, the outer of these linear-lanceolate, the inner broader, all with white-scarious margins; achenes light olive, sharply spinulose above, deeply 5-grooved, the beak less than twice as long as the body; pappus yellowish-tinged.

Type. Barren stony slope, altitude 3000 m., near the summit of Peet's Point, Willamette mountains, Oregon, *Peck 17967* (Herb. Willamette Univ.).

This is apparently closely related to *Taraxacum ovinum* Greene, and may possibly be conspecific with it, but it differs in some particulars, especially in the much narrower involucre bracts.

Willamette University,  
Salem, Oregon, March 25, 1940.

## PINUS MURICATA AND CUPRESSUS FORBESII IN BAJA CALIFORNIA

CARL EPLING AND WILLIAM ROBISON

The fact is generally known that *Pinus muricata* occurs on the mainland of Lower California, as well as on Cedros Island, but because few botanists have visited the inaccessible ridge where it occurs and because of the phytogeographic interest of the closed cone pines, the stand merits a brief description. The occurrence and survival of this species on Cedros Island will be discussed elsewhere by another author.

El Cañon de Pinitos, as the locality is known locally, lies to the west of San Antonio Mesa, between Rio San Ysidro and Rio San Antonio seventy miles south of Ensenada. It may be reached by an obscure track which leaves the main road in a northwesterly direction about two and one-half miles north of the entrance to the Guzman Ranch on San Antonio Mesa, or about three miles north of a group of conspicuous eucalypts near the head of the canyon leading to the Johnson Ranch (Rio San Antonio). In dry





FIGURE 1



FIGURE 2

PLATE 25. *PINUS MURICATA* IN BAJA CALIFORNIA. FIG. 1. Approximately one-third of present stand; *Arctostaphylos* undercover on upper part of slope; area regenerated after fire, chiefly *Ceanothus* and *Adenostoma*, on lower part of slope, the sharp line of demarcation running diagonally upward from right to left; foreground with two large specimens of *Cupressus Forbesii* in canyon bottom. FIG. 2. Habit of the larger trees; trunk of specimen at extreme right perhaps eight inches in diameter and twenty feet tall; Coastal Sage of the north slope in the background.





weather this track may be traversed by automobile for about four miles to the foot of the slope on which the pines are situated. The canyon itself runs in a westerly direction and is about two miles long. It debouches upon a coastal llano about a mile from the ocean.

The pines may be reached most easily from the end of the "road," by ascent of the shoulder which marks their eastern boundary. Once they are reached, a cleared trail may be found which was used in minor "logging" operations several years since. This trail leads upward to the main ridge and connects with several colonies by branch trails. In this way dense brush may be avoided.

The whole area has been severely burned and the original vegetation has been modified accordingly. At present, the north side of the canyon is covered chiefly by the Coastal Sage association in which *Salvia Munzii* is predominant, associated chiefly with *Artemisia californica*, *Viguera laciniata* and scattered low specimens of *Rhus laurina*. Occasional patches of *Adenostoma fasciculatum* var. *obtusifolium* still occur, however, and suggest a once wider distribution. The south side of the canyon is densely covered with chaparral, with several areas of Coastal Sage, in part at least induced by burning. The lower slopes, to the canyon bottom have been burned recently and are now covered with a dense tangle in which *Ceanothus verrucosus*, *C. tomentosus* var. *olivaceus* and *Adenostoma fasciculatum* var. *obtusifolium* are dominant.

*Pinus muricata* now occupies the uppermost more broken parts of the ridge, chiefly along the southern slope and extends sporadically downward half way to the bottom. The species ranges from east to west for perhaps a mile or more. At its western limit it spreads out fanwise and occupies the areas on the northern and western faces of the ridge. On the southern slope it formerly extended to the seaward western slope, but, except for about twenty small trees near its western limit, this part, perhaps a third of the stand, has been destroyed by recent fires. There is some regeneration of the stand in this area. At present, the conspicuous trees are scarcely as many as three thousand and, in the unburned area, very little reproduction is evident. The largest trees are perhaps twenty-five feet tall and six to eight inches in diameter. Such trees show ring counts of forty to sixty years. Within the stand itself and throughout the upper slopes, the undercover is mainly *Arctostaphylos pungens* with *A. bicolor*, *Quercus dumosa*, *Adenostoma fasciculatum* var. *obtusifolium* and *Cupressus Forbesii* as associates.

The cypress extends throughout the slope, beyond the range of the pine. It also occurs in the next canyon to the south, the entrance to which lies directly west of the Guzman Ranch. Several fairly large trees occur here. For the most part, however, the trees are small, are often depauperate and resemble the thickets of *Cupressus pygmaea* of the Mendocino Coast of Cali-

fornia. They may form cones when only two or three feet tall and as yet unbranched. Fairly large individuals occur also on the ridge. Reproduction is good in the burned areas.

Mention of *Cupressus macrocarpa* as occurring at San Quintin is frequently found in the literature. This statement must be a blunder. San Quintin is itself situated on low sandy soil on an estuary. Any trees nearby would be very conspicuous. There is no evidence that the cypress may be found in the interior hills to the east, for they are very arid, nor does the species occur in the low range of hills which lies immediately along the coast north of San Quintin. These are apparently of volcanic origin and are covered with Coastal Sage. The first named author has traversed this area both by automobile and by foot without finding any evidence of their occurrence there. It may be that specimens of *C. Forbesii* from the canyons described above, were ascribed to San Quintin, or it may be that cultivated trees of *C. macrocarpa*, which are planted at the small presidio near San Quintin, were thought to be native.

Department of Botany,  
University of California, Los Angeles,  
April, 1940.

## A REVISION OF THE GENUS *MONOLOPIA*

ETHEL CRUM

*Monolopia* is an endemic Californian genus of the Compositae belonging to section *Eriophyllanae* of the tribe *Helenieae*. It is confined mainly to the North and South Coast ranges, the bordering portions of the San Joaquin and Sacramento valleys and to cismontane southern California. All species occur in the inner South Coast Ranges which thus represent the center of distribution; probably, also the center of origin is located in the same general area. The distribution pattern presented by the genus is that of two morphologically rather primitive species, both with restricted ranges and habitats, and two morphologically more advanced species, more tolerant and widely ranging and apparently now actively extending their territory (text fig. 1).

All species of *Monolopia* are vernal annuals, inhabiting for the most part slopes and valleys in the Upper and Lower Sonoran zones; one species, *M. gracilens*, enters the Transition. When growing among other annual composites, the white lanate herbage, and the usually numerous bright yellow pedunculate heads, often one or two inches in diameter, are readily recognizable. Where species of the genus occur they are often dominant and whether in small colonies or covering extensive areas, constitute one of the most attractive components of the spring floral display in California.



As here delimited, *Monolopia* may be considered a resultant of three evolutionary tendencies toward reduction common in the *Helenieae*: reduction in number of involucre bracts and close correlation of these with the number of ray flowers, loss of receptacular bracts, loss of pappus; there is also at least one additional important evolutionary trend—the development of a sub-bilabiate ray corolla, manifested by a small posterior lobe. Excluding *Pseudobahia*, by some botanists considered a section of *Monolopia*, the genus constitutes a natural group of four species. The following combination of characters, in addition to those mentioned above, serve to distinguish the group: inflorescence paniculate, terminating the branches, the heads often rather long-pedunculate; the presence of black-pigmented hairs on the phyllaries, more conspicuously developed distally; presence of moniliform hairs on the lobes of the disk corollas.

The genera of the section *Eriophyllanae* most closely related to *Monolopia* are probably *Eriophyllum* and *Pseudobahia*. The *Eriophyllum lanatum* aggregate is probably ancestral to both *Monolopia* and *Pseudobahia*, also to certain annual species of *Eriophyllum*, such as *E. ambiguum* and *E. nubigenum* (Constance, L. the genus *Eriophyllum*. Univ. Calif. Publ. Bot. 18: 69–123. 1937). *Monolopia* agrees closely with these groups in the character of the indument and in the general aspect; it differs from both *Eriophyllum* and *Pseudobahia* in the sub-bilabiate ray corollas, and in the constant absence of pappus, and from *Pseudobahia* in addition by the reduced number of phyllaries and the details of floral structure.

Important tendencies toward divergence within the genus are: flattening of the achenes; union of the phyllaries. Flattening of the achenes has usually been considered an important character in the *Helenieae* and has been used to differentiate genera or other related groups. However, this tendency is by no means uniformly developed in *Monolopia*. Two of the species, *M. major* and *M. lanceolata*, have disk achenes which are markedly obcompressed, in this respect farthest removed from all members of the genus *Eriophyllum* (text fig. 2). Both species are marked by large size and vigor and agree in the divergent peduncles and large conspicuous heads with long, deeply dentate ray corollas. *Monolopia major*, shows evolutionary advance in such morphological characters as the united phyllaries, and the more obcompressed disk achenes which have developed a narrow membranous margin, usually more conspicuous near the base. Both *Monolopia lanceolata* and *M. major* have relatively extensive ranges; together they occupy territory from Tehama County to Riverside County, *M. major* being the only representative of the genus north of Contra Costa County and *M. lanceolata* the only representative south of Kern County. As indicated on the map (text fig. 1) by outlying stations, both are apparently actively extending their ranges. The two more primitive species have disk achenes of

almost equal width and thickness. They are further characterized by lower, more slender habit, distinct phyllaries, smaller heads, and shorter, subentire ray corollas. Their ranges and habitats are more restricted than those of *M. major* and *M. lanceolata*. *Monolopia gracilens*, the most primitive member of the genus, is confined to the South Coast Ranges, occupying for the most part, half-shaded slopes in the Upper Sonoran and Transition zones. The remaining species, here described as new, inhabits the low barren foothills of the Temblor and San Carlos ranges and of the Tehachapi Mountains at the head of San Joaquin Valley. The two species thus have different ranges and habitats and are separated morphologically by constant differences in habit such as the angle of divergence of the upper branches and peduncles, and by the length of the disk corollas, and the length and pubescence of the achenes.

The taxonomic history of *Monolopia* is relatively brief. The genus was erected by De Candolle in 1834 on specimens collected in California by Douglas. The name, derived from two Greek words meaning "single covering," refers to the uniseriate involucre. The generic description is based almost exclusively on *M. major*, the type species. In his comment on the second species named, *M. minor*, De Candolle states: "car. generis in floribus junioribus non rite vidi." The identity of *M. minor* remains doubtful. If properly represented by the Douglas specimens, so named in Gray Herbarium, it cannot be referred to *Monolopia*. Receptacular hairs are present, a character not observed in any *Monolopia* collection examined; no posterior lobe is present on the ray corollas. The combination of characters presented by the specimens of *M. minor* is not known in any species of *Eriophyllum* to which *M. minor* has been referred by Rydberg (N. Am. Fl. 34: 86. 1915). Heller believed he had rediscovered the species in *Pseudobahia Heermannii* but the phyllaries of the latter species are more numerous, of different shape, and show a median thickening easily observable even in immature specimens. Moreover, in the Gray Herbarium specimens of *M. minor*, the hairs at the base of the corolla throat, characteristic of *Pseudobahia*, cannot be observed. In generic characters, however, these specimens do not differ from *Baeria*, and, since they were probably collected in the coastal region of California, may represent immature, unusually lanate plants of *Baeria hirsutula* Greene. *Monolopia lanceolata* Nuttall was described in 1848 from plants collected at "Pueblo de los Angeles, Upper California" by William Gambel. This entity was considered by Gray (Bot. Calif. 1: 384. 1876) and by Hall (Univ. Calif. Publ. Bot. 3: 176. 1907) as a variety of *M. major*. It was referred erroneously by Bentham (Gen. Pl. 21: 400. 1873) to *Bahia arachnoidea* Fisch. & Ave.-Lall. *Monolopia gracilens* Gray was described in 1883 from specimens collected by Torrey "near New Almaden and Santa Cruz." Hall (*op. cit.*)



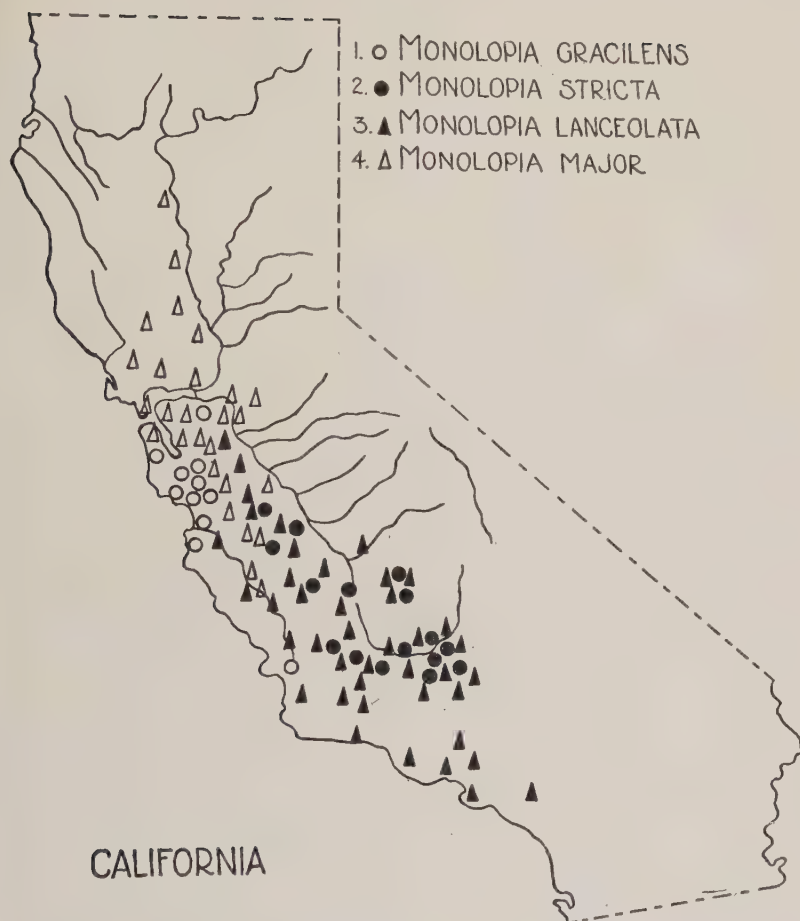


FIG. 1. Distribution of *Monolopia*.

stated in 1907 that *M. gracilens* "should be considered only a small-flowered variety of *M. major*," and in 1915 (N. Am. Fl. 34: 176) commented as follows: "Characters as given for *M. major* (of which this is perhaps a geographic race)." Concurring in these views, MacBride, in 1918, (Contrib. Gray Herb. n. ser. 3: 49.) reduced *M. gracilens* to a variety of *M. major*. There has been no recent comprehensive treatment of the genus.

Acknowledgments are due to Dr. Herbert L. Mason, Curator of the Herbarium, University of California, Berkeley (UC), at whose suggestion this study was undertaken and whose field observations, collections, and criticisms have been of material assistance; also to curators of the following herbaria for the loan of specimens: California Academy of Sciences (CA); Dudley Herbarium, Stanford University (D); Gray Herbarium, Har-

vard University (G); W. L. Jepson Herbarium, Berkeley (J); Missouri Botanical Garden (MB); New York Botanical Garden (NY); Academy of Natural Sciences, Philadelphia (PA); Pomona College, Claremont, California (P); United States National Herbarium (US); Vegetation Type Map Herbarium, California Forest and Range Experiment Station, Berkeley (VTM).

#### TAXONOMY

MONOLOPIA DC., Prodr. 6: 74. 1837; Bentham and Hooker, Gen. Pl. 2<sup>1</sup>: 400. 1873; Engler and Prantl, Pflanzenfam. 4<sup>5</sup>: 101, fig. 62, 258. 1891; Hall ex Rydberg, N. Am. Fl. 34: 82. 1915.

Vernal annuals with taproot. Stems erect, simple to many-branched at or above the base. Herbage lanate, the indument white except on distal portions of the involucre where black pigment is usually developed, often deciduous except at base of involucre and upper portion of peduncle. Lower leaves (1-4 pairs) opposite, oblanceolate, attenuate into a margined petiole; cauline leaves sessile, slightly amplexicaul, narrowly to broadly lanceolate or oblong lanceolate, apex obtuse, acute or acuminate; uppermost leaves similar, reduced, becoming bract-like. Heads heterogamous, few to numerous, medium to large, pedunculate, terminating the branches; peduncles rather long, strictly ascending to divergent-ascending. Involucre hemispheric or campanulate, foliaceous (or submembranous at base); phyllaries 6-13 (usually 8), 1-seriate (in *M. gracilens*, one to three small, lanceolate, hyaline, inner bracts sometimes present), distinct to the base, appressed, lanceolate-oblong to rhombic-ovate, acute or acuminate, the margins slightly imbricate; or phyllaries connate into a cup with ovate to deltoid lobes. Receptacle conic, glabrous, naked, nearly smooth, palisade-like or more or less scrobiculate. Rays 1-seriate, 6-13 (usually 8), corresponding in number to the phyllaries, pistillate, fertile, yellow, sub-bilabiate; limb of ray corolla spreading, usually ample, oval, oblong, cuneate-oblong or cuneate-obovate, the apex truncate and emarginate or 2- or 3-dentate, or rounded and entire or minutely denticulate or notched; posterior lobe minute, ovoid to suborbicular, denticulate or entire (rarely incised); tube short, slender, glandular-hispidulous. Disk florets few to numerous, hermaphroditic, fertile, tube slender, glandular-hispidulous, shorter than the throat; throat campanulate or tubular-campanulate; lobes 5, erect or slightly spreading, externally and internally bearing short moniliform hairs. Stamens 5, anthers ecaudate, apical appendages ovate. Style branches of rays slender, obtuse, of disk-florets stoutish, very obtuse or subtruncate. Achenes strigulose to glabrate, gray, black or brownish, uniform in color or, when immature, somewhat mottled, dimorphic, obpyramidal, the apex with a small areola (in *M. major* lateral margins of ray and disk achenes

and, rarely, ventral angle of ray achene narrowly membranous); ray achenes triquetrous, somewhat obcompressed, or width and thickness subequal, dorsally convex (sometimes subcarinate); disk achenes more or less obcompressed, carinate dorsally and ventrally, or quadrate, width and thickness subequal; achenes of central disk flowers sometimes not maturing.

Type species: *Monolopia major* DC.

#### KEY TO THE SPECIES

Phyllaries distinct to the base, the margins slightly imbricate; throat of disk corollas short-campanulate, abruptly contracted into the tube; disk achenes quadrate, not margined.

Disk achenes subequal in width and thickness; limb of ray corollas rounded, entire, slightly notched or denticulate at apex, 4-9 (or 16 mm.) long.

Peduncles strongly divergent at base; achenes glabrate, blackish or dark brown, 2.0 mm. long; basal and lower cauline leaves approximate, usually conspicuously dentate; Upper Sonoran and Transition zones, Santa Cruz and Santa Lucia mountains, San Mateo and Contra Costa counties to San Luis Obispo County

1. *M. gracilens*

Peduncles strict; achenes densely gray-strigulose, 2.2-3.0 mm. long; leaves entire or nearly so, the lower not crowded; Lower Sonoran Zone, foothills and plains bordering the San Joaquin Valley, San Benito County to Kern County

2. *M. stricta*

Disk achenes obcompressed, usually uniformly and densely gray-strigulose, 2.0-3.8 mm. long; limb of ray corollas truncate, dentate at apex, 9.0-21 mm. long; peduncles divergent; Upper and Lower Sonoran zones; inner South Coast Ranges, plains and foothills bordering San Joaquin Valley, Tehachapi region; cismontane southern California

3. *M. lanceolata*

Phyllaries united one-half their length, the margins of the lobes not at all imbricate; throat of disk corollas tubular-campanulate, attenuate into the tube; limb of ray corollas truncate, dentate at apex, 8-21 mm. long; disk achenes obcompressed, glabrate or strigulose toward apex, narrowly membranous margined especially toward base, 2.5-4.0 mm. long; Upper Sonoran Zone, Coast Ranges and western borders of Sacramento-San Joaquin Valley, Tehama County to Monterey County

4. *M. major*

1. *MONOLOPIA GRACILENS* Gray, Proc. Am. Acad. 19: 20. 1883.  
*M. major* var. *gracilens* Macbr. Contr. Gray Herb. 3: 49. 1918.

Stems 10-40 cm. (45-90 cm.) high, slender to stoutish, main stem erect, simple, branched near the middle, the branches divergent, or often many-branched at base, the branches decumbent-ascending; herbage white-lanate or -arachnoid, the indument often partially deciduous in age (persisting at least at apex of peduncle); basal and lower cauline leaves, 3-7 cm. long, .2-1 cm. broad, subrosulate or crowded below, narrowly to broadly oblanceolate, margins saliently dentate to subentire; median and upper cauline leaves broadly lanceolate or subligulate, margins saliently



dentate to subentire, apex acute or acuminate, 2–10 cm. long, .3–2.5 cm. broad; uppermost leaves similar or narrowly lanceolate, often entire; inflorescence subcorymbose; peduncles divergent-ascending, 2.5–12 cm. long; heads 1–70, disk 7–10 mm. in diameter; phyllaries 7–11 (6–13), distinct to base, 1-seriate, the margins slightly imbricate, or sometimes with one to three small hyaline inner bracts, distally foliaceous, usually persistently black-lanate and somewhat glandular-granuliferous, proximally submembranous, striately 6- to 9-nerved, the indument with less black pigment and usually deciduous, narrowly to broadly ovate or rhombic, attenuate into the acute or acuminate apex, 5–6 mm. long, 1.7–2.5 mm. broad; receptacle sharply conical, 2–3.2 mm. long, 1.1–2 mm. in diameter, the attachment scars conspicuous; rays 7–11 (6–13), 4–9 mm. (or 16 mm.) long, deep yellow with 7–11 greenish veins, the limb broadly to narrowly oval or oblong, apex subentire, shallowly emarginate, or very minutely notched or crenulate, posterior lobe deltoid-ovate to suborbicular, entire or minutely denticulate, .1–.8 mm. long, tube hispidulous, .8–1.2 mm. long; disk-florets 10–90, deep yellow, 1.5–2.6 mm. long, throat campanulate, 1–1.5 mm. long, tube glandular-hispidulous, .4–.8 mm. long, lobes .2–.4 mm. long, moniliform hairs sparse; achenes black or blackish brown, when immature with grayish or brownish mottling, minutely and sparsely strigulose to glabrate; ray achenes slightly convex and often inconspicuously carinate dorsally, 1.7–2 mm. long, 1.8 mm. broad, .7 mm. thick; disk achenes 2 mm. long, .6–.8 mm. broad, .6–.8 mm. thick.

Partly shaded slopes at altitudes of 500 to 3800 feet, Upper Sonoran and Transition zones; often occurring on disturbed areas such as roadside cuts and chaparral burns; also on serpentine outcrops; South Coast ranges (mainly Santa Cruz and Santa Lucia mountains), San Mateo and Contra Costa counties to San Luis Obispo County. Flowering period: April, May, June.

Specimens examined. Contra Costa County: Mount Diablo, *Eastwood 4518* (CA, US), *L. S. Rose 35166* (CA, MB, P, UC); Mount Diablo, Eagle Ridge, *M. L. Bowerman 1339* (UC), below summit, *767* (UC), Muir area, southeast slope, *2057* (UC), below Pioneer Camp, *1946* (UC). San Mateo County: Pilarcitos Lake and Canyon, *Davy 1124* (UC); Lake Pilarcitos, June, 1893, *Michener & Bioletti* (MB); Woodside, May 9, 1920, *Eric Walther* (CA); Berenda Farm near Redwood City, May 9, 1930, *Otto Holm* (CA). Santa Clara County: New Almaden, 1865, *Torrey 237* (G, type; NY, isotype?); Almaden Ridge, *J. T. Howell 1898* (CA); Alamitos Creek, 1.5 miles south of New Almaden, *Constance 2078* (NY, UC); Alamitos Creek near Hacienda School, May 12, 1923, *L. Lorraine* (D); Santa Clara, *S. G. Isaman* (G); Black Mountain road, May 5, 1894, *Dudley* (D); Black Mountain, 3 miles below Mountain House, Adobe Creek road, *Pendleton 1484* (CA, UC, US); Loma Prieta, eastern slope, *Davy 596*

(UC), 663 (UC); Loma Prieta, *Elmer 5012* (CA, D, MB, NY, UC, US); Gilroy, *Elmer 4729* (CA, D, MB, NY, P, UC, US); Stevens Creek, *Pendleton 776* (UC); San Martin, *Chandler 915* (UC); Saratoga, *Davy 246* (UC); Coyote Creek, 3 miles east of Mardrone, *J. T. Howell 12991* (CA, UC); mouth of Coyote Creek Canyon, *Hoover 3269* (UC); Monte Bello Ridge, *H. S. Yates 5520* (VTM); Hecker Pass, Watsonville-Gilroy road, *H. M. Hall 13064* (P); Hecker Pass, 1.4 miles northeast of summit, *Crum 2089* (CA, D, G, MB, NY, P, PA, UC, US); summit of first ridge west of Los Gatos, *Heller 7428* (D, G, MB, NY, PA, UC, US); Santa Cruz Mountains near Los Gatos, June 4, 1907, *R. J. Smith* (UC). Santa Cruz County: Santa Cruz Mountains, *Rattan 36* (D), June, 1889, *Brandeggee* (UC); Santa Cruz, *M. E. Jones 2333* (D, P), July 12, 1883, *Pringle* (G), *Bolander 48* (G); Charmichael's Mill, *Pendleton 938* (UC, US); Camp Idle, Santa Cruz Mountains, *H. Davis 41* (UC); Hecker Pass, west of summit, *Keck 4568* (CA, UC, US); west of Mount Umunhum, *C. M. Belshaw 2239* (VTM); Glenwood, Santa Cruz Mountains, April, 1900, *H. Davis* (G, US); Upper San Lorenzo Canyon, 9 miles north of Boulder Creek, *Crum 2090* (CA, D, G, MB, NY, PA, P, UC, US). Monterey County: Monterey, 1897, *A. L. Bolton* (UC); Pajaro River, *Eastwood 4169* (CA, US). San Luis Obispo County: Pecho Creek, April 30, 1908, *Condit* (UC); Cambria Road, Santa Rosa Creek, June 13, 1911, *Condit* (UC).

*Monolopia gracilens* Gray is restricted to the South Coast Ranges of central California. This species has a higher altitudinal range than have the other members of the genus; apparently, also, it is less tolerant of aridity. In the Santa Cruz Mountains, where by far the greatest number of collections have been made, favorable habitats are openings in the mixed redwood forest, especially on steep slopes in disturbed soil; on Mount Diablo the species occurs on chaparral burns at elevations of 1500 feet to the summit. No specimens from the Santa Lucia Mountains in Monterey County have been seen but this may be due to less intensive collecting in this region. The species recurs in typical form in San Luis Obispo County. Although, to a slight extent, both range and habitat overlap those of *M. lanceolata* Nutt. and *M. major* DC., no observations of mixed colonies have been reported.

The growth form of this species is distinctive: in typical individuals the main stem is strictly erect and usually unbranched to a distance of one-fourth to three-fourths of the total height; the branches diverge widely from the main stem; the paniculate inflorescence with heads terminating the branches is subcorymbose; often at the base in robust individuals there is, in addition, a whorl of decumbent-ascending primary branches. The basal and lower cauline leaves are usually crowded, sometimes almost rosulate. The specific name is slightly misleading; although

many small, slender individuals occur in all observed colonies, in favorable situations plants ninety centimeters high, bearing sixty to seventy heads in full flower at one time, are not infrequent. At the type locality where the species occurs on a serpentine outcrop, the average height of individuals is less than observed elsewhere.

*Monolopia gracilens* may be regarded as the most primitive member of the genus: the phyllaries are more variable in number than those of the remaining species and often one to three small scarious inner bracts are present. Furthermore, the achenes, which are subequal in width and thickness, show little divergence in this respect from the same structures in *Eriophyllum*.

2. *Monolopia stricta* sp. nov. Herba annua leviter albolanata glabratave; caules 10–60 cm. alti, simplices multiramosive, ramis adscendentibus ad basin versus floriferis; folia basalia, 3.2–8 cm. longa, .3–3 cm. lata, oblanceolata, in petiolis attenuata, plerumque integra; folia caulina inferiora similia; folia caulina media 3.2–6 cm. longa, .6–2.5 cm. lata, lanceolata oblongo-lanceolatave, apicibus acutis obtusisve, integra aut rarius undulata seu remote denticulata; pedunculi plerumque 3–5 cm. (1–14 cm.) longi, stricte adscendentes; capitula 1–15 ad numerosa (20–75), disci diametro 9–14 mm.; phyllaria plerumque 8, libera marginibus paullo imbricatis 5–7 mm. longa, 2–4 mm. lata, anguste ad late ovato-lanceolata rhomboideo-lanceolatave, in breviacuminatum apicem attenuata, ad basin versus obscure 3- ad 10-nervata, albolanata plerumque ad apicem versus pilis nigris tecta; receptaculum conicum glabrum laevigatum vel paullo scrobiculatum, basi 2–3 mm. diametro, 1.5–2 mm. altum; flores radii plerumque 8, aurei, limbis 4–15 mm. longi, (aliquando ad 2 mm. reducti), oblongis aut ellipticis, 8- ad 10-nervatis, apice rotundo integro vel minute 2- ad 3-denticulato, tubo .8–1.5 mm. longo, lobo posteriore ovato vel subrotundo, plerumque integro, ca. .3–1 mm. longo; flores disci plerumque numerosi (40–65) aurei, 1.5–2.5 mm. longi, tubo .3–.9 mm. longo, lobis .3–.5 mm. longis, pilis moniliformis sparsis obsoletisve; achenia uniformiter denseque griseo-strigulosa, radii haud obcompressa, 2.5–2.8 mm. (3 mm.) longa, 1.1–1.2 mm. lata, .8 mm. crassitudine, disci non vel haud obcompressa, 2.5–2.8 mm. (3 mm.) longa, .6–.8 mm. lata, .5–.6 mm. crassitudine.

Type. Two miles west of Lost Hills, Kern County, California, altitude 300 feet, May 2, 1935, *Herbert L. Mason 9314* (U.C. Herb. no. 628483; isotypes, CA, D, G, MB, NY, P, PA, US).

Open plains or slopes, Lower Sonoran zone, from 160 to 2000 feet altitude; lower foothills and valleys, San Carlos and Temblor ranges, San Benito County to Kern County; head and eastward borders of San Joaquin Valley; Kern County to Tulare County. Flowering period: March, April.



Stems 10–60 cm. high, simple to many-branched at the base or above, the branches ascending, floriferous from near base; herbage lightly white-lanate to floccose or glabrate, indument more dense and persistent at apex of peduncle; basal and lower cauline leaves 3.2–8 cm. long, .3–3 cm. broad, oblanceolate, usually entire, often withered at flowering time; median cauline leaves 3.2–6 cm. long, .6–2.5 cm. broad, lanceolate to oblong-lanceolate, apices obtuse or acutish, entire, or more rarely undulate or remotely dentate; peduncles usually 3–5 cm. (1–14 cm.) long, strictly ascending, the heads scattered, not subcorymbose; heads 1–15, or in robust, much-branched individuals numerous (20–75), the disk 9–14 mm. in diameter; phyllaries distinct, the margins slightly imbricate, usually 8, 5–7 mm. long, 2–4 mm. broad, narrowly to broadly ovate-lanceolate or rhombic-ovate, attenuate into the short-acuminate apex, distal portion usually black-lanate, obscurely 3- to 10-nerved toward base; receptacle 2–3 mm. in diameter at base, 1.5–2 mm. high, conical, smooth or slightly scrobiculate; rays usually 8, yellow, 8- to 10-nerved, 4–15 mm. long (or sometimes much reduced, 2 mm. long), the limb oblong to elliptical, apex rounded, entire or very minutely notched or 2- or 3-denticulate, tube .8–1.5 mm., posterior lobe .3–1 mm. long, ovate to roundish, entire or nearly so (rarely 2-parted); disk-florets in well developed heads, 40–65, yellow, 1.5–2.5 mm. long, tube .3–.9 mm. long, lobes .3–.5 mm. long, moniliform hairs sparse or obsolete; achenes uniformly densely gray-strigulose, ray achenes slightly obcompressed, 2.5–2.8 mm. (3 mm.) long, 1.1–1.2 mm. broad, .8 mm. thick, disk achenes not or scarcely obcompressed, 2.5–2.8 mm. (3 mm.) long, .6–.8 mm. broad, .5–.6 mm. thick.

Specimens examined. Merced County: 10 miles south of Los Banos, *Hoover 2882* (UC). San Benito County: Little Panoche Pass, *Eastwood & Howell 5137* (CA, UC); Panoche, April 9, 1937, *Y. W. Winblad* (CA). Fresno County: Zapato Chino, March 25, 1893, *Brandeggee* (UC, US); Huron, March 24, 1893, *Brandeggee* (UC); flood plain of Little Panoche Creek, *Hoover 404* (CA, UC), *J. Morrison 2810* (D, G, NY, UC, US); Little Panoche, April 8, 1937, *Y. W. Winblad* (CA); between Mendota and Firebaugh, *Hoover 882* (UC); Oil Canyon, *Eastwood & Howell 2057* (CA); Oil City, *L. S. Rose 35070* (UC); Jacalitos Canyon, 4 miles south of Coalinga, *J. T. Howell 5807* (CA). Kings County: Kettleman Hills above Kettleman City, *Hoover 2923* (UC). Tulare County: Exeter, February, 1900, *G. C. Roeding* (UC); Portersville, March 25, 1932, *Mrs. G. Earle Kelly* (UC); Terra Bella, *Abrams 10849* (D, P); 1.5 miles east of Terra Bella, *Constance & Mason 2122* (NY, UC). San Luis Obispo County: Carrizo Plain, *Keck & Clausen 3143* (D); Carrizo Plain near Soda Lake, *Eastwood & Howell 4117* (CA, UC). Kern County: between Blackwells Corner and Lost Hills, *Mason 6911* (UC); 3 miles east of Lost

Hills, *R. S. Ferris* 9037 (CA, D, NY, UC); Buena Vista Hills, April 9, 1893, *Eastwood* (NY, UC); 3 miles south of Blackwells Corner, *J. T. Howell* 5899 (CA); Blackwells Corner, *Crum* 1380 (UC); *Hoover* 947 (UC); Antelope Plain, 4 miles east of Blackwells Corner, *Crum* 1965a (UC); west end of Choice Valley, 3.5 miles from Annette, *Wiggins* 7968 (D, UC); 7.5 miles north of Olig, *P. L. Johannsen* 1433 (UC, VTM); Bakersfield, *Davy* 1893B (UC); Caliente Creek, 17 miles from Bakersfield, April 11, 1935, *K. Esau* (CA); mouth of San Emigdio Canyon, *A. Lewis* 631 (VTM); 6 miles west of Buttonwillow, *Hoover* 1850 (UC); Mount Breckenridge road, Greenhorn Mountains, *L. Benson* 3066 (D, US); plains east of Kern, April 6, 1905, *Heller* (NY, US); Arvin, *Clokey* 6958 (NY).

*Monolopia stricta* is confined mainly to the barren foothills of the inner South Coast and Tehachapi ranges and to the adjacent valleys. Judging from the number of collections, the species is best established on alkaline plains in Kern County. Although within the range of *M. lanceolata*, and frequently associated with that species, no intermediates have been observed. From Kern County northward along the eastern margin of San Joaquin Valley in Tulare County several collections of less typical plants have been made. The range of *M. stricta* does not overlap that of either *M. gracilens* or *M. major*.

In habit, *Monolopia stricta* differs markedly from the other three species of the genus. In typical, much-branched individuals, the main stem is short and the many, ascending branches terminate at all levels in comparatively short, strictly ascending peduncles. The strict position of the peduncles is unique in the genus, and in the field gives the species a very characteristic aspect. In addition, when the two species are associated in the same colony, the smaller heads and subentire shorter ray corollas of *M. stricta* contrast sharply with the large heads and conspicuous, deeply dentate ray corollas of *M. lanceolata*.

With respect to the distinct phyllaries, the small heads with subentire ray corollas, and the shape of the achenes, *Monolopia stricta* resembles *M. gracilens*. In both species the ray achenes are only slightly obcompressed and the disk achenes subequal in width and thickness. In growth habit and general aspect, however, the two species are very different: the main stem of *M. gracilens* is typically dominant, branched above and with branches and peduncles widely diverging. The achenes of *M. stricta* are constantly longer than those of *M. gracilens* and differ also in being uniformly short-strigulose rather than glabrate. The number of phyllaries is more constant in *M. stricta* (in well-developed heads almost uniformly eight); this condition may be regarded as an evolutionary advance compared to the varying number of phyllaries in *M. gracilens*.

Certain collections from Tulare County, and occasionally elsewhere, show what appears to be a response to more favorable

soil and moisture conditions. Stems are tall and slender with long internodes, peduncles longer than in the typical form and both rays and achenes are at the upper limits of variation in length. The aspect of such plants is less characteristic but in critical characters of achenes and ray corollas agree with other collections of the species. The strict position of the longer, more slender peduncles of these less typical plants is not always evident in herbarium specimens since they are often slightly wilted before being pressed.

3. *MONOLOPIA LANCEOLATA* Nutt. Proc. Acad. Phila. 4: 21. 1848; Jour. Acad. Phila. ser. 2, 1: 175. 1848. *M. major* var. *lanceolata* Gray, Bot. Calif. 1: 384. 1876; Hall, Univ. Calif. Publ. Bot. 3: 176. 1907, N. Am. Fl. 34: 82. 1915.

Stems 10–45 cm. (7–65 cm) high, stout to slender, erect, and simple to diffusely much branched from the base or above, the branches spreading; herbage densely white-lanate to glabrate on leaves and stems, usually dense on upper portion of peduncles and at base of involucre; basal and lower cauline leaves 1.3–10 cm. long, .4–1.3 cm. broad, oblanceolate, obtuse at apex; median cauline leaves 3–11 cm. long, .15–1.8 cm. broad, linear-lanceolate to broadly lanceolate, margins entire or undulate, more rarely dentate or remotely dentate, narrowed to obtuse or acutish apex; uppermost cauline leaves narrowly lanceolate or linear-lanceolate, the apex acute or acuminate; peduncles divergent, 1–13 cm. long; heads 1–70, the disk 9–20 mm. in diameter; phyllaries usually 8 (6–11), distinct, margins slightly imbricate, or very rarely some heads with two or three phyllaries united near base, 5–11 mm. long, 2.5–5 mm. broad, lanceolate to ovate- or rhombic-lanceolate, apex acute or acuminate, obscurely to rather prominently 3- to 5-nerved above the base, externally more or less white-lanate, the indument often deciduous except at base, distally the hairs with black pigment (or this rarely lacking); receptacle 2.5 mm. in diameter, 2.5–5 mm. high, broadly conical, acute, the attachment scars conspicuous, scrobiculate or palisade-like; rays usually 8 (6–11), conspicuous, bright yellow, 8- to 11-nerved, 9–21 mm. long, narrowly to broadly oblong or cuneate-oblong, 2- to 3-dentate at truncate apex, teeth .7–2 mm. long; tube 1.3–2.5 mm. long, glandular-hispidulous; disk-florets 25–100 (or only 2–6 in simple, dwarf plants), bright yellow, 2.5–3.8 mm. long, tube .5–2 mm. long, glandular-hispidulous, throat campanulate, 1–2.2 mm. long, lobes .3–.5 mm. long, moniliform hairs sparse and short to rather dense; achenes uniformly and densely (rarely sparsely) gray-strigulose, ray achenes obcompressed, convex, flat or subcarinate dorsally, 2.2–3.8 mm. (rarely 2 mm.) long, 1.3–1.5 mm. broad, .6–1.1 mm. thick, disk achenes noticeably obcompressed, obtusely angled or carinate dorsally and ventrally, sometimes asymmetrically so, 2.2–3.8 mm. (rarely 2 mm.) long, 1.2–1.5 mm. broad, .5–.8 mm. thick.



Valleys and open slopes in Upper and Lower Sonoran zones, 250 to 4400 feet altitude; locally common or abundant in colonies which are often extensive and dominant over considerable areas; inner South Coast ranges and adjacent valleys, San Joaquin County to San Luis Obispo and Kern counties, north along the eastern borders of San Joaquin Valley to Fresno County; Tehachapi region, eastward to Mojave, Kern County; cismontane southern California, Santa Barbara County to Riverside County. Flowering period, March, April, May.

Specimens examined. Without exact locality: "line of the San Joaquin, March, 1846, Fremont's Expedition to California." San Joaquin County: between Mountain House and Tracy, 2 miles east of Midway, *Mason 6827* (UC); Corral Hollow, Mount Hamilton Range, *H. K. Sharsmith 1482* (D, UC), *1490a* (UC). Stanislaus County: 4 miles above mouth of Arroyo del Puerto, Mount Hamilton Range, *H. K. Sharsmith 1541* (UC), *1622* (D, UC); 12 miles above mouth of Arroyo del Puerto, *H. K. Sharsmith 1811* (D, UC). Merced County: Wrights, 17 miles west of Los Banos, April 3, 1912, *Wootton* (US); 10 miles south of Los Banos, *Hoover 2887* (UC). San Benito County: Griswolds Canyon, May 29, 1899, *Dudley* (D); near summit of Panoche Pass, March 25, 1923, *F. O. Ballou* (D); Little Panoche Pass, *Eastwood & Howell 5136* (CA). Monterey County: Arroyo Seco, March, 1890, *E. K. Abbott* (D, NY); lower Arroyo Seco Canyon, *Hoover 2984* (UC); Arroyo Seco, 10 miles from Soledad, *R. S. Ferris 1947* (D); Soledad, *Congdon* (UC); 5 miles northeast of Abbotts, *Constance & Hoover 2061* (NY, UC); between King City and San Lucas, *R. S. Ferris 7503* (D, UC); Poncho Rico Canyon, 6 miles east of San Bernardo, *J. T. Howell 5992* (CA); 3.5 miles east of Pleyto Well, *C. A. Graham 238* (VTM); west of Kirk Canyon, *H. S. Yates 5369* (VTM); south of King City near San Lorenzo Creek, April 2, 1903, *Dudley* (D); 2 miles south of King City, *A. M. Carter 1107* (CA, UC, US); 4 miles north of San Ardo, Salinas River Valley, *Constance 2085* (NY, UC); junction of Bryson road with Jolon-Bradley road, *R. S. Ferris 8441* (CA, D, G, UC, US); 12 miles southeast of Jolon, *A. M. Carter 1088* (D, G, MB, UC), *1089* (UC); summit of Jolon grade, *Keck 2068* (P). Fresno County: Alcalde, April, 1891, *Brandegge* (UC); Alcalde Canyon, 4 miles west of Coalinga, *Crum 1964* (CA, D, G, MB, NY, P, PA, UC, US); between Alcalde and Coalinga, *Eastwood 13513* (CA); 14 miles east of Coalinga, *J. T. Howett 5797* (CA); Los Gatos Canyon, 4 miles north of Coalinga, *J. T. Howell 5801* (CA); Huron, May 7, 1893, *Eastwood* (G); Kings River at Piedra, *L. S. Rose 34095* (UC); 3 miles northwest of Mercy Hot Springs, *Crum 1959* (CA, D, G, MB, NY, UC, US). Kings County: Kettleman Hills above Kettleman City, *Hoover 2927* (UC). Tulare County: near Frazier Pass from Porterville, March 26, 1897, *Dudley* (D); Tulare, *Davy 3072* (UC); between Earlimart and Delano, *Eastwood 3951* (CA, US); be-



FIG. 2. Achenes of *Monolopia*, ventral and lateral surfaces. *M. gracilens*: ray, a, ventral, b, lateral; disk, c, ventral, d, lateral. *M. stricta*: ray, e, ventral, f, lateral; disk, g, ventral, h, lateral. *M. lanceolata*: ray, i, ventral, j, lateral; disk, k, ventral, l, lateral. *M. major*: ray, m, ventral, n, lateral; disk, o, q, ventral, p, r, lateral.

tween Richgrove and Ducor, Hoover 456 (UC). San Luis Obispo County: Paso Robles, April 9, 1899, J. H. Barber (P, UC, US), A5 (MB, UC); Shandon, Geo. B. Grant 5753 (UC, D); Carrizo Plain, March 29, 1910, Condit (UC); northeast edge of Carrizo Plain, Wiggins 5822 (CA, D, P, NY, UC, US); Cuyama Canyon, April 28, 1926, M. E. Jones (P); upper Cuyama Valley, L. Benson 3570 (US); Cuyama Valley, 45 miles west of Maricopa, L. S. Rose 36066 (MB, UC); Cholame, Eastwood 13873 (CA), Wiggins

5785 (CA, D, P, NY, UC); 35 miles east of Paso Robles, *Munz 10183* (P); La Panza, *E. Armstrong 1116* (VTM); San Miguel, *A. Lewis 45* (UC, VTM); Union, *Eastwood & Howell 2000* (CA); Nipomo, *Brewer 420* (G, sheet with both *M. lanceolata* and *M. major*; UC and US sheets, *M. major* only; probably, however, the latter species does not occur at Nipomo); 2.2 miles southeast of Nipomo, *C. M. Belshaw 1624* (VTM); west side Cottonwood grade, headwaters of Estrella River, *Keck 2168* (D). Kern County: Fort Tejon and vicinity, *Xantus De Vesey 49* (US), *Abrams 11734* (D); Tejon Pass, May 12, 1882, *Pringle* (MB, PA, NY, US); Tehachapi, June, 1884, *K. Brandegee* (UC), May 20, 1903, *M. E. Jones* (D, P, US), May 5, 1905, *Heller* (UC), *Eastwood 3242* (CA, US); Tehachapi Plains, *Hasse & Davidson 1731* (UC); Bakersfield, *Davy 1704* (UC), *1734* (UC); 3 miles south of Blackwells Corner, *J. T. Howell 5898* (CA); between Blackwells Corner and Lost Hills, *Mason 6907* (UC); 4 miles east of Blackwells Corner, *Crum 1965b* (D, G, NY, UC, US); Antelope Valley, 1 mile northwest of Kecks Corner, *Crum 1966* (CA, D, G, MB, NY, P, PA, UC, US); between Mojave station and Tehachapi, February-May, 1885, *Gray* (G); Mojave, *Davy 2166* (UC); south of Mojave, *I. M. Johnston 2253* (P, US); 5 miles south of Mojave, *Munz 10079* (P); between Rosamund and Mojave, *Abrams 11202* (D); Willow Springs, *Munz 10021* (P, UC); Kern Canyon, *Heller 7656* (D, G, MB, PA, NY, UC, US); north of Kern, March 16, 1913, *Wooton* (US); Kern River, *E. Roy Weston 507* (CA); Rattlesnake Grade, Greenhorn Mountains, *E. Roy Weston 601* (CA); Caliente Canyon, April 6, 1935, *E. Roy Weston* (CA); Salt Creek, south end of San Joaquin Valley, *A. Lewis 625* (VTM, UC); San Emigdio Canyon, *Davy 1990* (UC); Elk Hills, *P. L. Johannsen 1471* (VTM, UC); west end of Choice Valley, 3.5 miles from Annette, *Wiggins 7966* (D, UC); northwest of Fellows, *P. L. Johannsen 1467* (VTM, UC); 6 miles west of Buttonwillow, *Hoover 1849* (UC); Cottonwood Canyon, Avenal Ridge, 4 miles northeast of Cholame, *Constance 2091* (NY, UC); Carrizo Plain road, 1 mile below junction of Maricopa-Santa Maria highway, *R. S. Ferris 9304* (D); 15 miles southwest of Maricopa, *Munz 13602* (D, P, UC). Santa Barbara County: Santa Barbara, *Elmer 3777* (CA, D, G, MB, NY, P, UC, US); Point Sal, 18 miles southwest of Santa Maria, *A. M. Carter 1100* (G, MB, NY, UC); near Loma Paloma, San Rafael Mountains, *Hall 7805* (UC); Cuyama Canyon, April 28, 1926, *M. E. Jones* (P). Ventura County: above San Buena Ventura, March 5, 1866, *S. F. Peckham* (US); Cuyama River, *Clokey 6953* (NY). Los Angeles County: San Fernando below Los Angeles, 1850, *Parry* (G, NY); Los Angeles, 1853-54, *Bigelow* (NY, US); Highland Park, *Geo. B. Grant 798* (D, G, MB, PA), *L. A. Greata* (D, UC); Cahuenga Pass, *Brewer 185* (G, UC, US); Pasadena, May 3, 1882, *M. E. Jones* (P); Elizabeth Lake, *Parish 1962* (D, UC); San Pedro Hills near Rocky Point, *Abrams 3142* (D, P, PA, NY);



Santa Monica Mountains, *Abrams 1317* (D, NY); Palos Verdes Hills near Redondo, April 9, 1897, *McClatchie* (D, NY); Tujunga Canyon, *Peirson 526* (J). Riverside County: Menifee, 1893, *M. A. King* (UC).

*Monolopia lanceolata* Nuttall is the most widely ranging species of the genus and its most southerly representative. The distribution is apparently continuous and the species common within its range; outlying collections are not far removed from well-populated areas, excepting those from stations in the desert; these colonies presumably arrived by way of Tehachapi Pass where the species has often been collected. These occurrences and also the northerly stations along the eastern borders of the San Joaquin Valley may represent recent colonization. The range of *M. lanceolata* includes that of *M. stricta* and overlaps that of *M. major* in the inner South Coast ranges and adjacent valleys from Monterey and Merced counties to San Joaquin County. Different habitat requirements segregate this species from *M. gracilens* which also occurs in the South Coast ranges but at higher elevations and, in general, nearer the coast.

Apparently tolerant of both aridity and alkalinity, *Monolopia lanceolata* finds a favorable habitat along the barren western borders of the San Joaquin Valley and in the foothills and passes of the inner South Coast and Tehachapi ranges; it is especially abundant in Kern and San Luis Obispo counties. Collections indicate that in California north of Tehachapi the species inhabits the Lower Sonoran zone, also the Upper Sonoran at relatively low altitudes, mainly in portions adjacent to or not far distant from Lower Sonoran extensions; in the Tehachapi Range and in southern California, it occurs in the mountains at considerable elevations (Tehachapi, 4000 feet, May 20, 1905, *M. E. Jones*; Loma Paloma, 4400 feet, *Hall 7805*); from San Luis Obispo County southward to Los Angeles County, the range extends westward to the coast.

Robust habit, diffuse branching, long, divergent peduncles and large heads with conspicuous dentate rays, characterize *Monolopia lanceolata*. All of these characters serve to distinguish the species from *M. stricta*; the achenes are much more obcompressed than those of *M. stricta* and *M. gracilens*; in pubescence, which is usually uniformly and densely strigulose, the achenes resemble those of *M. stricta*. From *M. major* it is readily distinguished by the distinct phyllaries and by the details of floral and achenal characters mentioned below in the discussion of the latter species.

The range of variation in *Monolopia lanceolata* is rather wide: in some plants the indument is dense and nearly uniformly distributed; other plants are glabrate; the indument is more or less deciduous on leaves and stems and on the distal portion of the phyllaries; it is always somewhat persistent, however, on the upper portion of the peduncle just below the involucre.

Variation in amount and color of pubescence is apparently not correlated with geographic distribution. Field notes mention that certain collections of glabrate plants are from wet situations. The amount of black pigment developed in the hairs (mainly of the distal portion) of the phyllaries also varies widely; in some collections, also, the black hairs are deciduous, the white persistent; in a few collections, black pigment in the pubescence of the phyllaries is lacking. The variation in achenal characters, however, has some geographic significance. Colonies in certain regions show characteristic divergences: achenes of plants in the vicinity of Santa Barbara are unusually long (3.2 mm.); those from near Jolon, Monterey County, are narrow and also somewhat asymmetrical, the dorsal and ventral carinae being displaced from the median position; certain colonies in Kern and Tulare counties lower the limits of achenal length to two millimeters.

*Monolopia lanceolata* and *M. stricta* both follow their preferred habitat around the head of San Joaquin Valley and northward along the eastern borders of San Joaquin Valley to Fresno and Tulare counties respectively. On these northeastern outposts which may represent recent colonization, the two species are less markedly different in aspect. Plants of *M. lanceolata* are tall and more slender; the divergence of the peduncles is less noticeable and the diameter of the disk is smaller. As mentioned above, *M. stricta* from the same region is also somewhat modified, hence in general appearance the two species approach each other. Conceivably, these changes may be due to the reaction of both species to new environmental factors, such as more fertile soil and increased rainfall. However, in *M. lanceolata* variation in the length and width of the achenes is much greater than occurs within a similar area elsewhere. This diversity may be due to genetic disturbance caused possibly by a certain amount of hybridization between the two species.

4. *MONOLOPIA MAJOR* DC. Prodr. 6: 74. 1837.

Stems slender to robust, 8–50 cm. (65–70 cm.) high, erect, simple or simple at base, dichotomously branched above, or less frequently branched at base, branches few to numerous, spreading; herbage white-lanate, the indument more or less deciduous in age, persistent at base of involucre and on upper portion of peduncles near apex; basal and lower cauline leaves not crowded, .7–10 cm. long, .15–.7 cm. broad, oblanceolate, the margins saliently to obscurely dentate, undulate or subentire, the apex obtuse, acute or acuminate; median cauline leaves 3–16 cm. long, .4–1.5 cm. broad, narrowly to broadly lanceolate, the margins saliently dentate to remotely or obscurely undulate or entire; peduncles 1–12 cm. long, divergent; heads 1–20 (or 35), disk 10–19 mm. in diameter; involucre 8–13 mm. long, the phyllaries united for about one-half their length, lobes usually 8 (5–10), 3–6 mm.

long, 3–7 mm. broad, ovate or deltoid, usually slightly broader than long, 3-veined, the veins more prominent in fruit; receptacle 3–6 mm. high, 3.5–5 mm. in diameter, conical to ovoid, more or less scrobiculate; rays usually 8 (5–10), bright yellow, 8–20 mm. long, 4–14 mm. broad, the limb oblanceolate-oblong or cuneate-oblong with 9–13 greenish veins, apex truncate, dentate or subincised, the teeth .5–2 mm. long, the tube slightly hispidulose to glabrate, 2–3 mm. long; disk-florets 45–170 (or in dwarf plants 3–5 only), bright yellow, 3–4.5 mm. long, the tube and lower portion of throat hispidulous, tube .8–2.3 mm. long, throat tubular-campanulate, attenuate at base, 1.1–2.5 mm. long, lobes .3–.6 mm. long, moniliform hairs usually numerous; achenes black or blackish-brown, glabrate or somewhat strigulose dorsally and ventrally near apex, the hairs slightly curled, laterally with a narrow membranous margin usually best developed toward the base, ray achenes obcompressed (ventral angle rarely with narrow membranous margin), 2.5–4 mm. long, 1.3–1.5 mm. broad, 8–1.1 mm. thick; disk achenes much obcompressed, more or less carinate dorsally and ventrally, 2.5–4 mm. long, 1–1.6 mm. broad, .7–.8 mm. thick.

Locally abundant, slopes and valleys, Upper and Lower Sonoran zones, altitude 600 to 1500 feet; inner North Coast ranges and adjacent valleys, Tehama County to Marin, Napa and Solano counties; western borders of Sacramento-San Joaquin Valley, San Joaquin County, in Stanislaus County east to Waterford; inner South Coast ranges and adjacent valleys, Contra Costa and San Mateo counties to Monterey County. Flowering period: March, April, May.

Specimens examined. Without locality: California, 1833, *Douglas*, (G, NY); Feather River, May, 1853, *Bigelow* (G, NY); Sacramento Valley, April, 1876, *Lemmon* (UC). Tehama County: Salt Creek, tributary of the Cottonwood, *Jepson 21025* (J). Glenn County: west of Willows, *Eastwood 11142* (CA). Lake County: without locality, June, 1884, *Brandegee* (UC); Lower Lake, *A. M. Bowman 256* (D). Colusa County: without locality, April, 1889, *K. Brandegee* (UC); Venado, *Hoover 3223* (UC); Bear Valley, 4 miles south of Leesville, *Crum 2035* (CA, D, G, MB, NY, P, PA, UC, US). Sonoma County: Petaluma, *Bolander 4665* (G, UC, US), May, 1880, *Congdon* (D); east of Santa Rosa, April 4, 1902, *Heller* (US). Yolo County: near Madison, *Heller & Brown 5411* (D, G, MB, NY, P, PA, US). Sacramento County: Sacramento, *Hartweg 1789* (G, NY). Napa County: Napa Junction, April, 1888, *Sonne* (UC); Napa Valley, May, 1863, *Bigelow* (NY, PA). Solano County: Montezuma Hills, *Jepson 21057* (J), March 21, 1902, *R. H. Platt* (UC); Little Oak, near Vacaville, *Jepson 21027* (J). Marin County: San Rafael, *Rattan* (D). San Francisco County: Potrero Hills near San Francisco, April, 1857, *Bloomer* (G, NY); near San Fran-



cisco, 1866, *Kellogg* (G, MB, NY, US); San Francisco, *Sutton Hayes* 487 "El Paso and Fort Yuma wagon road expedition" (US). San Mateo County: Santa Cruz Mountains, May, 1898, *Abrams* (D). Contra Costa County: Antioch, *Kellogg & Harford* 508 (CA, MB, NY), April 8, 1869, *Kellogg* (D), May, 1883, *K. Brandegee* (UC), May, 1891, *Brandegee* (UC), *Brandegee* (D, CA), *Davy* 929 (MB); Byron, *C. F. Baker* 2796 (CA, P, UC); Byron Springs, *Eastwood* 3803 (CA, G, NY, US); south of Byron, *Wiggins* 4584 (D, P, UC); 2 miles west of Byron, *Crum* 1741 (CA, D, G, MB, NY, UC, US), *Crum* 2083 (CA, D, G, MB, NY, UC, US); Moraga Valley, 1883, *Chesnut* (UC); Briones Valley, *Chandler* 582 (UC); Kirker Pass, *Hoover* 311 (UC); Lone Tree Valley, *Hoover* 2899 (UC); Mount Diablo, south of Arroyo del Cerro, *M. L. Bowerman* 1862 (UC), Oyster Ridge, 1365, (UC), east of Alamo Creek Canyon, 2196 (UC). San Joaquin County: French Camp, *J. A. Sanford* 16 (UC); Linden, May, 1896, *F. W. Gunnison* (UC); Bethany, *C. F. Baker* 2790 (CA, G, MB, NY, P, UC, US); Tracy, *Jepson* 9595 (J), *Crum* 590 (G, UC); Hospital Canyon, *E. E. Stanford* 1231 (MB); Corral Hollow, Mount Hamilton Range, *H. K. Sharsmith* 1490 (UC), 1495a (UC), 1500a (D, UC); Morada near Stockton, April 20, 1920, *Mrs. A. H. Ashley* (CA). Alameda County: Oakland Hills, *Bolander* 328 (G, NY), *Bolander* 2392 (UC, US); Oakland, April, 1889, *Chesnut* (US); Berkeley Hills, May, 1893, *Michener & Bioletti* (MB); head of Claremont Canyon near Berkeley, *Tracy* 1432 (D, P, UC); Redwood Canyon, east Oakland, *W. W. Carruth* (CA); Livermore Valley, March, 1887, *Rattan* (D); Livermore, March 25, 1888, *Greene* (US); near eastern end of Altamont Pass, *Abrams* 9945 (D); Coast Range near Tracy, *E. E. Stanford* 793 (D, G, MB, P); Mountain House, *L. S. Rose* 33022 (CA, NY, UC); Corral Hollow near Pottery, Mount Hamilton Range, *H. K. Sharsmith* 3415 (D, UC); 1 mile northeast of Tesla, *H. S. Yates* 5497 (VTM, UC); 1.5 miles northwest of Tesla, *Crum* 1975 (CA, D, G, MB, NY, UC, US); divide between Corral Hollow and Arroyo Seco, Livermore road, *R. S. Ferris* 9427 (D, UC). Santa Clara County: Coyote Creek, Coyote, *Davy* 98 (UC); Coyote Creek, *Jepson* 21026 (J); near Coyote, *R. S. Ferris* 819 (D); 4 miles south of San Jose, May 1, 1887, *Rattan* (D); near Botany Building, Stanford University, March 30, 1893, *Dudley* (D); Los Buellos Hills, Milpitas, April, 1906, *R. J. Smith* (D, UC), Los Buellos Hills, April, 1905, *C. S. Williamson* (PA); Mount Hamilton, July 14, 1906, *R. J. Smith* (PA); Pacheco Pass, *Eastwood* 14095 (CA). Stanislaus County: Westley, *Hoover* 231 (UC); 4 miles east of Waterford, *Hoover* 756 (UC); Salada Canyon, 9 miles southwest of Patterson, *Schreiber* 2300 (VTM, UC), *Crum* 1760 (CA, D, G, MB, NY, UC, US). Merced County: Merced, *Eastwood* 4427 (CA). San Benito County: 2.7 miles south of Paicines, *R. S. Ferris* 8342 (D, G, UC); 1 mile north of Paicines, *J. T. Howell* 11048 (CA); 8 miles northwest of Hernandez, *Crum* 990 (G, UC).

Monterey County: 4 miles southwest of Soledad, *Mason 5042* (UC); Poncho Rico Canyon, 6.6 miles east of San Bernardo, *J. T. Howell 5996* (CA); 1 mile northeast of King City, *R. C. Wilson 419* (VTM, UC).

*Monolopia major* DC. is especially abundant in central California in Alameda, Contra Costa, and San Joaquin counties, less so in Santa Clara County; from this center of population, which includes fifty per cent of the localities of collection, the species extends northward and southward, mainly along the interior valleys and lower foothills of the inner North and South Coast ranges; northward, it is the sole representative of the genus; southward, it overlaps the range of *M. lanceolata* and in a few localities is contiguous to that of *M. gracilens*. Near the limits of its range, the species is apparently casual, many counties being represented by a single collection. This scarcity is probably real; although certain of these counties have been visited by comparatively few collectors, in others, for example, Lake, Napa, and Solano counties, collecting has been rather intensive. Westward and eastward, respectively, the most outlying records of occurrence are: San Rafael, Marin County (*Rattan*); four miles east of Waterford, Stanislaus County (*Hoover 756*), a near approach to the Sierra Nevada foothills. Since *M. major* is very common in cultivated fields, its presence at certain outlying stations may be due to transportation of the achenes with seeds of crop plants.

The most favorable habitats of this species are open slopes or valleys in the Upper Sonoran zone, the altitudinal range being lower than that of *Monolopia gracilens*. On Mount Diablo, for example, *M. major* occurs on grassy hillsides from the base to about 1500 feet altitude (*M. L. Bowerman 2196*), *M. gracilens* on chaparral burns above that elevation to near the summit (*M. L. Bowerman 767*). The species is probably less tolerant of aridity than either *M. lanceolata* or *M. stricta*.

In general aspect, *Monolopia major* is very similar to *M. lanceolata* although averaging larger in all its structures; the two species agree in their robust habit, diffuse branching, long peduncles, and large conspicuous heads with long, dentate rays. Compared to *M. lanceolata*, however, typical plants of *M. major* have less numerous branches, fewer heads and longer ray corollas. The species differs also from *M. lanceolata* in the longer, tubular-campanulate disk corollas, and in the longer, more flattened, glabrate or sparsely strigulose achenes; the pubescence of the achenes in *M. major* is sparse and distributed mainly on the upper portion while in *M. lanceolata* it is usually dense and uniformly distributed; moreover, in *M. major* the hairs are recumbent and slightly curved while in *M. lanceolata* they are straight and closely appressed.

In relation to the assumed ancestral condition, *Monolopia major* is the most divergent member of the genus. This is indi-

cated by the connate phyllaries, which form a lobed cup, and by the achenes which are the most extremely obcompressed in the genus and which have developed a narrow membranous margin on the proximal third or, more rarely, extending the entire length. This latter tendency is most marked toward the northern limits of distribution. Although the species is otherwise fairly constant throughout its range, occasional aberrant individuals are encountered: ray and disk corollas may be cream color and pale yellow respectively instead of the usual bright yellow (*Hoover 311*); ray corollas are sometimes deeply lobed (lobes 6 mm. long, *Hoover 2899*). Although occasionally occurring together, *M. major* and *M. lanceolata* apparently do not hybridize. Among the collections examined, a few individuals were noted in which two or three of the phyllaries of a head were united near the base, the others distinct; in remaining characters, these plants were referable to *M. lanceolata*.

#### SPECIES EXCLUDED

*Monolopia bahiaefolia* Benth. Pl. Hartw. 317. 1849 = PSEUDOBAHIA BAHIAEFOLIA (Benth.) Rydb.

*Monolopia bahiaefolia* var. *pinnatifida* Gray, Bot. Calif. 1: 383. 1876 = PSEUDOBAHIA HEERMANNII (Durand.) Rydb.

*Monolopia californica* (Lindl.) Fisch., Mey. & Ave.-Lall., Ind. Sem. Hort. Petrop. 9:80. 1843 = LASTHENIA GLABRATA Lindl.

*Monolopia glabrata* (Lindl.) Fisch. & Mey. Ind. Sem. Hort. Petrop. 9: 80. 1843 = LASTHENIA GLABRATA Lindl.

*Monolopia Heermannii* Durand. in Jour. Acad. Phila. ser. 2, 3: 93. 1855 = PSEUDOBAHIA HEERMANNII (Durand.) Rydb.

*Monolopia minor* DC. Prodr. 6: 74. 1837 = BAERIA sp.?

Department of Botany,  
University of California, Berkeley,  
November 1, 1939.

#### REVIEW

*Flora of Mount Shasta.* By WILLIAM BRIDGE COOKE. American Midland Naturalist. Volume 23, pp. 497-572 with 8 plates. The University Press, Notre Dame, Indiana, May, 1940.

With this publication, "the Naturalist" has added another item to its useful series of West-American local floras. Until recently, the great majority of floristic surveys of this section have been manuals of state-wide or regional scope. Very few western states are even yet adequately provided with general floras. It is not surprising, therefore, that intensive study of local areas has lagged badly.

Mount Shasta is at once the second highest peak in the Cascade Range and nearly its southernmost, being well separated by a broad belt of semiarid vegetation from its closest, geologically related fellows. The first catalogue of its flora was provided in



1898, by C. Hart Merriam, who accounted for approximately 185 species. Numerous other collectors have visited the mountain, but its flora appears to be comparatively meagre in variety, and no intensive study of it had been undertaken until the present one.

Mr. Cooke, restricting his efforts to that portion of the mountain lying above the 4000 foot contour, has collected diligently over a period of four summers, while stationed at Shasta Alpine Lodge. The paper recognizes some 420 specific and subspecific entities, an increase of nearly two-thirds over Merriam's catalogue, although a few of the latter's plants have not been re-collected. The "master set" of the writer's collections is deposited in the Herbarium of the University of Cincinnati; partial sets are deposited in the herbaria at the following institutions: Oregon State College; University of California, Berkeley; California Academy of Sciences, San Francisco; Stanford University; Harvard University; New York Botanical Garden. The task of determining the material has been almost wholly assigned to the hands of accomplished specialists, some twenty-five of them having contributed keys, or identifications, or otherwise assisted in the study.

It is remarkable that so large a mountain possesses no endemic species, although a few plants of restricted range are shared only with Crater Lake, the mountains of the Klamath system, or Mount Lassen and Mount Pleasant. The sources and affinities of the flora are left for future discussion, but it is indicated that elements have been received from the main Cascade Range, the northern Great Basin (Columbia Plateau), the Klamath-Siskiyou region and from Californian sources.

Thumb-nail sketches summarize previous botanical explorations, the physiography, drainage, geology, climate and life zones of the area. Such interesting miscellaneous items are included as an explanation of the technique employed by the California Co-operative Snow Surveys in estimating the depth of snow pack, and the origin and path of mud flows are described. Photographs depict the principal plant associations, characteristic species, and scenic and geological points of especial interest. A sketch-map shows the contours and principal physiographic features, the trails and the place-names.

The keys, which are very concise for the most part, are of the "entomological" or "knit one, purl two" variety. Common names are provided, where available, for each species, and distribution and abundance are noted. No specimens are cited; the only species provided for are those collected by the writer, himself, and he gives no indication that he has attempted to find and examine the herbarium material obtained by previous collectors.

By the gradual accretion of such local floras, the time is rapidly approaching when a floristic study of the entire Cascade Range will be practicable. There are already floras or catalogues for the two highest mountains, and for peaks toward the northern

and southern limits of the range, but many of the intervening sections are little collected and very poorly known. When such a study can be undertaken and completed by a thoroughly competent botanist, and his identifications checked by specialists, we shall have a work of the most fundamental significance to all discussions of Pacific Coast phyto-geography.—L. CONSTANCE, Department of Botany, University of California, Berkeley.

## NOTES AND NEWS

**MISTLETOE ON PERSIMMON.** A few years ago there was established at the Citrus Experiment Station, Riverside, a variety collection of the persimmon consisting mainly of *Diospyros Kaki*, but also containing a few trees of *D. virginiana* and *D. Lotus*. In January, 1939, I noticed on the bare branches of all three species the evergreen leaves of a mistletoe, identified by Dr. Carl Wolf, Rancho Santa Ana Botanic Garden, as *Phoradendron longispicum* Trel. Forty-four of the 205 trees in the planting were affected. In January, 1940, mistletoe was found on sixty trees of the collection. Apparently the seeds were brought by birds such as the linnet and cedar waxwing, which find both mistletoe berries and persimmons a welcome addition to their winter diet.

Fig trees in an adjacent orchard are free from mistletoe, the fruit maturing earlier in the season than the persimmon. Mistletoe is commonly found on soft-wood trees such as willow, poplar, and buckeye, and sometimes on fruit trees such as the walnut. In 1910 Bray reported *Phoradendron flavescens* on *Diospyros virginiana* in Texas (Bray, W. L. The mistletoe pest in the south-west. U. S. Dept. Agr., Bur. Pl. Ind. Bull. 166: 7-33. 1910.).

A rather diligent survey failed to show any mistletoe infestation on indigenous trees in the immediate vicinity of the Citrus Experiment Station or on any of the numerous ornamental plants and fruit trees on the Station grounds with the exception of the persimmon. Apparently the mistletoe seeds reach these persimmon trees in profusion; they find the rough bark a suitable place for germination and the wood a favorable host for the haustoria.—IRA J. CONDIT, Citrus Experiment Station, University of California, Riverside.

**A NEW LOCALITY FOR SALVIA EREMOSTACHYA JEPSON.** *Salvia Vaseyi* (Porter) Parish is both abundant and conspicuous at the mouth of Hellhole Canyon west of Borego, San Diego County, California. In 1939 the author found there a hybrid with *S. apiana*, although that species was nowhere in the vicinity, usually being found much higher. It was noted, however, that the topography, soil and vegetation of the south wall of the canyon were very similar to those of Indian Canyon, the type locality of *S. eremostachya*. Search was made therefore for both *S. apiana* Jepson and *S. eremostachya* but was unsuccessful. Returning during the present

season, a hybrid was found which could only be interpreted as originating between *S. Vaseyi* and *S. eremostachya*. This was found at the very floor of the canyon adjacent to a lone juniper, not far from the end of the road. Search was accordingly made in the draw above the juniper and was rewarded by the finding of several plants of the second parent about an eighth of a mile up the slope at the lower margin of the juniper belt proper. There were apparently no others in the immediate vicinity. The range of *S. eremostachya*, is accordingly extended to a fourth station approximately eight miles south of the type locality, extending the whole range to an airline distance of approximately twenty-five miles. It may be noted also that the conformation of the corolla of this species is strongly suggestive of that of *S. carduacea*.—CARL EPLING, Department of Botany, University of California, Los Angeles.

Dr. Carl W. Sharsmith, formerly of the Department of Botany, State College of Washington, Pullman, has accepted a position as Instructor in Botany at the University of Minnesota.

#### PROCEEDINGS OF THE CALIFORNIA BOTANICAL SOCIETY

March 14, 1940. Meeting, 2093 Life Sciences Building, University of California, Berkeley, at 7:45 p. m. The First Vice-President, Dr. G. Ledyard Stebbins, Jr., occupied the chair. Dr. T. Harper Goodspeed, Professor of Botany and Director of the University Botanical Garden, University of California, Berkeley, spoke on, "University of California Botanical Expeditions in South America." The address was illustrated by exceptionally fine colored films.

April 18, 1940. Meeting, 2093 Life Sciences Building, University of California, Berkeley, at 7:45 p. m. The First Vice-President, Dr. G. Ledyard Stebbins, Jr., presided over an informal "live plants and specimens meeting". Among the participating exhibitors were the following: Mr. Ernest Ball, stem-apices of palms; Dr. Norman C. Boke, phyllodes of *Acacia* and areoles of cacti; Drs. Jens Clausen, D. D. Keck and William Hiesey, *Layia* hybrids; Mr. A. A. Beetle, living Cyperaceae; Miss Alice Eastwood, cultivated plants from Australia, New Zealand and South Africa; Mr. Louis L. Edmunds, cultivated shrubs; Mr. F. W. Gould, flowers and fruit of *Camassia*; Dr. A. W. Herre, lichens; Mr. H. E. McMin, cultivated shrubs, chiefly Proteaceae; Mr. John L. Morrison, living South American plants grown from seed obtained by the expeditions, and herbarium and cytological material of *Streptanthus*; Dr. Palmer Stockwell, refrigerated pines; Dr. Helen Marr Wheeler and Mr. James Walters, living plants, herbarium specimens and photographs of *Nicotiana*; Mr. Jack Whitehead, succulents from Mexico and the southwestern United States.—L. CONSTANCE, Secretary.



## INDEX TO VOLUME V

For classified articles see: Notices of Publication; Reviews. New scientific names and page numbers of principal entries of species and varieties are printed in bold-face type.

- Acacia Greggii*, 5; *paucispina*, 6; *vernica*, 5, 6, 7  
*Acalypha Lindheimeri*, 9  
*Agave Lechuguilla*, 6, 7  
*Agoseris aurantiaca*, 237  
*Agrostis scabra*, 236  
*Allium crenulatum*, 240  
*Allotropa virgata*, 237  
*Alnus acuminata*, 11; *densiflora*, 152, pl. 153  
*Amsinckia intermedia*, 237, nutlets toxic to swine, horses and cattle, 202  
*Andropogon barbinodis*, 8; *hirtiflorus*, 8  
Angiosperms, Phylogeny of, 209  
*Anthericum pomeridianum*, 141  
*Arbutus xalapensis*, 11  
*Arctostaphylos*, 38; burl formation, pl. facing 44; effects of fire on, pl. facing 44, 46; *glandulosa*, fig. 39; *morroensis*, 42, fig. 44; Notes on genus, 38; *otayensis*, 43, fig. 44; *Parryana* var. *pinetorum*, 46, pl. facing 46; *pilosula*, fig. 44, 45; *pinetorum*, 46; *pungens*, 11; *rudis*, 41, fig. 44; *silvicola*, 40, fig. 44  
*Aristida adscensionis*, 8; *divaricata*, 8  
Arizona, *Teucrium glandulosum* in California and, 135  
*Artemisia filifolia*, 5  
*Arthrobotryum atrum*, 77; *spongiosum*, 75, figs. 75, 76  
*Asphodelus*, 139  
*Atriplex canescens*, 5, 6  
Avery, Priscilla, 197, fig. 197  
  
*Baeria hirsutula*, 253  
*Bahia absinthifolia*, 5; *arachnoidea*, 253  
Baja California, New species of *Eriogonum* from, 158; New species of *Viscainoa* from, 161; *Pinus muricata* and *Cupressus Forbesii* in, 248  
Baker, M. S., Studies in western violets, III, 218  
Baldwin, J. T., Cytophyletic analysis of certain annual and biennial *Crassulaceae*, 184  
Ball, C. R., Dr. Setchell and Alaska Willows, 231  
*Berberis trifoliata*, 6  
*Bidens heterosperma*, 11  
  
*Bouteloua chondrosioides*, 8; *gracilis*, 8; *hirsuta*, 8; *radicosa*, 8  
*Bouvardia triphylla*, 10  
*Bowiea*, 137  
*Brayulinea densa*, 9  
Brazil, New species of *Lecidea* from, 235  
*Bromus carinatus*, 236; *Suksdorfii*, 236  
*Buddleia scordioides*, 6  
  
California Botanical Society, Members, 205; Proceedings of, 47, 175, 204, 273  
California, *Ceanothus* in, 13; *Elodea densa* Casp. in, 103; Genus *Helianthemum* in, 81; New species of *Cirsium* from, 85; *Protocoronospora* in, 241; *Teucrium glandulosum* in Arizona and, 135  
*Calliandra humilis*, 9  
*Calypso borealis*, 237  
*Camassia*, 137; *Leichtlinii*, 147  
Campbell, D. H., pl. facing 204  
*Carex microptera*, 236; *scirpoidea*, 236  
*Carduus nutans*, 201; *pycncephalus*, 201, 240; *tenuiflorus*, 240  
Carter, A. M., Review: Manual of the liverworts of West Virginia, 238  
*Cassia Wislizenii*, 7  
*Castilleja mexicana*, 9  
Cave, M., Priscilla Avery, 196  
*Ceanothus buxifolius*, 10; in California, 13; *cuneatus* var. *ramulosus*, 14; *papillosus* var. *Roweanus*, 13; *ramulosus*, 14  
*Celtis pallida*, 5, 6, 7  
*Cenchrus echinatus*, 79  
*Centaurea Picris*, 200; *melitensis*, 200; *repens*, 200  
*Ceratonía siliqua*, 177, 178, pl. 179  
Charleston Mountains, Nevada, Two species of *Draba* from, 127  
*Cheilotheca khasiana*, 116; *malayana*, 116  
Chihuahua, vegetation of, 1, pl. facing 6, 8, 12; distribution of, fig. 4  
*Chilopsis linearis*, 6  
*Chimaphila*, 116  
*Chlorogalum angustifolium*, 141, 144; *divaricatum*, 143; *grandiflorum*, 141, 144; *Leichtlinii*, 147; Monograph of the genus, 137; *parviflorum*, 141, 145; *pomeridianum*, 141, var. *divaricatum*, 143, var. *minus*, 144; *purpureum*, 141, 146

- Chrysanthemum carinatum*, 79  
*Cicerbita muralis*, 125  
*Cirsium campylon*, 85, fig. 87, 89; fontinale, fig. 87, 89, var. *obispoense*, 89; New species from California, 85; *Peckii*, 97; *wallowense*, 247  
*Clethra*, 116  
*Coldenia Greggii*, 5, 6; *hispidissima*, 5  
*Colganina Lemmoni*, 10; *longifolia*, 10  
 Colorado, Violets of, 16  
 Compositae, Two new, from the Wal-lowa Mountains of Oregon, 247  
*Condalia lycioides*, 5, 6, 7; *spathulata*, 5, 6, 7  
 Cone variation in Digger Pine, 72  
 Condit, I. J., Mistletoe on Persimmon, 272  
 Constance, L., Genera of the tribe of *Hydrophyllae* of the *Hydrophyllaceae*, 28  
 Constance, L., Reviews: Flora of Mount Shasta, 270; Flowering plants and ferns of Mt. Rainier, 134; Plants of Crater Lake National Park, 171  
 Copeland, E. B., Review: Flora Taxonomica Mexicana, 170  
 Copeland, H. F., Phylogeny of the angiosperms, 209; Portrait of John Gill Lemmon, 77; Structure of Monotropis and classification of the *Monotropoideae*, 105  
 Cory, V. L., Six thistles recently introduced into Texas, 200  
*Coryphantha macromeris*, 6  
*Cotyledon*, 188, 190, 191  
*Cowania*, 130; *Stansburiana*, 8, 10  
*Crassulaceae*, Cytophyletic analysis of, 184  
*Crocantthemum*, 84  
*Crotalaria sagittalis*, 11  
*Croton neomexicanus*, 5  
 Cruciferae, Mexico and southwestern United States, notes on, 129  
 Crum, E. K., Alice Eastwood's Eightieth Birthday Anniversary, 74; Revision of the genus *Monolopia*, 250  
*Cryptophila pudica*, 105  
*Cupressus arizonica*, 11; *Forbesii*, 248, pl. facing 248; *macrocarpa*, 250; *pygmaea*, 249  
*Cyperus seslerioides*, 10  
 Cytophyletic analysis of certain annual and biennial *Crassulaceae*, 184  
*Dalea Grayi*, 9; *scoparia*, 5  
 Darling, L., *Protocoronospora* on *Phoradendron flavescens* in California, 241  
*Dasyliirion Wheeleri*, 6  
*Decemium*, 28  
*Desmodium neomexicanum*, 11  
*Diamorpha cymosa*, 186, pl. 189, 190; *pusilla*, 184, 186; *Smallii*, 186  
*Dicranopteris pubescens*, 171  
 Digger pine, Cone variation in, 72, fig. 73  
*Diospyros Kaki*, 272; *Lotus*, 272; *virginiana*, 272  
*Draba asterophora*, 147; *corrugata*, 148; *crassifolia*, 128; *cruciata*, 150, 151, var. *integrifolia*, 151; *densifolia*, 148; *glacialis* var. *pectinata*, 148, 149; *globosa*, 148, 149, var. *sphaerula*, 148; *Lemmonii*, 147, 148, 151; *lonchocarpa*, 128; *Nelsonii*, 149; *nivalis*, 128, 151, var. *californica*, 150; Notes on, in Sierra Nevada, 147; *oligosperma*, 148, 149; *paucifructus*, 127, 128; *Paysonii*, 148; *pectinata*, 148; *sierae*, 149, 151; *sphaerula*, 148; *stenoloba*, 128; Two species from Charleston Mountains, Nevada, 127; *vestita*, 148  
*Drymaria tenella*, 11  
*Dryopteris Maxoni*, 171  
*Dyschoriste decumbens*, 9, 10  
 Eastwood, Alice, Eightieth birthday anniversary, 74, pl. facing 74  
*Echinocactus horizonthalonius*, 6  
*Echinocereus conglomeratus*, 6; *dasyacanthus*, 6; *stramineus*, 6  
*Ellisia*, 33  
*Elodea canadensis*, 103; *densa* in California, 103  
*Ephedra antisiphilitica*, 7; *Torreyana*, 5  
*Epilobium glareosum*, 237  
 Epling, C., New locality for *Salvia eremostachya* Jepson, 272; Note on occurrence of *Salvia* in the New World, 34; Notes on *Scutellariae* of western North America, 49; *Teucrium glandulosum* in California, 135; Two Mexican species of *Hyptis*, 15  
 Epling, C., and W. Robison, *Pinus muricata* and *Cupressus Forbesii* in Baja California, 248  
*Eragrostis mexicana*, 8, 11  
*Erigeron aureus*, 237; *divergens*, 9, 10  
*Eriogonum atrorubens*, 10; *elongatum*, pl. 159; New species from Baja California, 158; *Vollmeri*, 158, pl. 159

- Eriophyllum ambiguum*, 251; *nubigenum*, 251; *lanatum*, 251  
*Eryngium Wrightii*, 9  
*Escobaria tuberculosa*, 6  
*Eucrypta*, 33  
*Euphorbia antisiphilitica*, 6; *Parryi*, 5  
*Exobasidium*, 241  
  
*Flourensia cennua*, 5, 6  
*Fouquieria splendens*, 6  
  
Gander, F. F., New records of alien plants in San Diego County, California, 79  
*Gaura gracilis*, 9  
Gentry, H. S., New species of *Viscainoa* from Baja California, 161  
*Geranium niveum*, 11  
*Gloesporium*, 241  
*Gnaphalium chilense*, 10  
*Goniophlebium Collinsii*, 171; *fraternum*, 171; *laevigatum*, 171; *Rosei*, 171, *stramineum*, 171  
*Greggia camporum*, 131, var. *angustifolia*, 131, var. *linearifolia*, 132; *linearifolia*, 132  
*Grossularia tularensis*, 103  
  
Haasis, F. W., Transparent mounts for field herbaria, 121  
*Habenaria unalaskensis*, 237  
*Haplopappus eximius*, 168, subsp. *Peirsonii*, 169, subsp. *typicus*, 168; New subspecies in, 166; *racemosus*, 166, subsp. *lucidus*, 167, subsp. *pinetorum*, 166  
*Hastingsia*, 137; *alba*, 137; *bracteosa*, 137  
*Helianthemum glomeratum*, 9, 11; *Greenei*, 84; in California, 81; *sco-parium*, 84, var. *Aldersonii*, 84, var. *vulgare*, 84; *suffrutescens*, 81, fig. 83, 84  
*Heliotropium Greggii*, 5  
*Hemiphylacus*, 138  
Henderson, L. F., New thistle from Oregon, 97  
*Herbaria*, field, transparent mounts for, 121  
Herre, A. W. C. T., New species of *Lecidea* from Brazil, 235  
*Hesperocallis*, 138  
*Hilaria mutica*, 7  
Hitchcock, C. L., Two interesting species of *Draba* from the Charleston Mountains, Nevada, 127  
Hoerl, R. A., New species of *Arthrobotryum*, 75  
Hoover, R. F., Monograph of the genus *Chlorogalum*, 137  
*Houstonia Wrightii*, 9, 10  
  
*Hymenoclea monogyra*, 5  
*Hymenopappus mexicanus*, 9, 11  
*Hyptis iodantha*, 16; *perpulcher*, 15; Two Mexican species of, 15  
Hydrophyllaceae, Genera of the tribe  
Hydrophyllaceae of, 28  
*Hydrophyllum*, 33  
  
*Indigofera ornithopodioides*, 11  
Inflorescences, Some abnormal, 177  
*Ipomoea costellata*, 10; *madrensis*, 11  
  
*Jatropha spathulata*, 6  
Johnson, A. M., Some abnormal inflorescences, 177  
*Juncus Regellii*, 237  
*Juniperus mexicana*, 8, 10, 11  
  
*Kalanchöe*, 188  
*Kallstroemia parviflora*, 79  
Keck, D. D., Identity of *Madia dissitiflora* (Nutt.) Torr. & Gray, 169; New subspecies in *Haplopappus*, 166; Notes on *Orthocarpus*, 164  
Keck, D. D., Reviews: Desert wild flowers, 239; Keys to the phyla of organisms including keys to the orders of the plant kingdom, 172  
*Koeberlinia spinosa*, 5, 6, 7  
  
Labiateae, Principal concentration areas in New World, fig. 34  
*Lactuca*, in western North America, Notes on, 123; *muralis*, 125; *pulchella*, 123; *saligna*, 126; *Scariola*, 126; var. *integrata*, 126; *spicata*, 125; *tatarica* subsp. *pulchella*, 123; *virosa*, 125  
*Laothöe*, 140; *angustifolia*, 144; *divaricata*, 143; *parviflora*, 145; *pomeridiana*, 141; *purpurea*, 146  
*Lasthenia glabrata*, 270  
*Lecidea*, New species from Brazil, 235; *viçosensis*, 235  
*Leiostemon Thurberi*, 5  
Lemmon, J. G., Portrait of, 77  
*Lesquerella argentea*, 133; *lasiocarpa*, 134, var. *Berlandieri*, 134  
*Leucophyllum laevigatum*, 7  
*Linum australe*, 9  
*Lippia Wrightii*, 6  
*Lithospermum cobrense*, 9, 10  
*Lupinus Shrevei*, 9  
*Lycium Cooperi*, 155; *Shockleyi*, 155  
  
McCulloch, E. C., Nutlets of *Am-sinckia intermedia* toxic to swine, horses and cattle, 202  
McMinn, H. E., Notes on genus *Ceanothus* in California, 13  
*Macrocalyx*, 28



- Madia dissitiflora*, 169, 237; Identity of, 169; *exigua*, 170; *gracilis*, 169; *sativa* subsp. *dissitiflora*, 169, var. *dissitiflora*, 169
- Madorella dissitiflora*, 169
- Mason, H. L., *Elodea densa* Casp. in California, 103; Pleistocene record of *Pseudotsuga macrocarpa*, 233
- Mason, H. L., Reviews: Flora of Riverside and vicinity, 102; Illustrated Manual of California shrubs, 173; Leguminous plants of Wisconsin, 101; Manual of aquatic plants, 237
- Meconella oregana*, 240
- Melampodium leucanthum*, 5
- Melica Smithii*, 236
- Mexico, certain Cruciferae of, Notes on, 129; Two species of *Hyptis* from, 15
- Microrhamnus ericoides*, 5
- Mimosa biuncifera*, 7, 8; *dysocarpa*, 8, 10
- Mistletoe on persimmon, 272
- Monolopia*, achenes, fig. 262; *bahiaefolia*, 270, var. *pinnatifida*, 270; *californica*, 270; distribution map, 252; *glabrata*, 270; *gracilis*, 255; *Heermannii*, 270; *lanceolata*, 255, 261; major, 255, 266, var. *gracilis*, 255; var. *lanceolata*, 261; minor, 270; revision of genus, 250; *stricta*, 255, 258
- Monotropastrum ampullaceum*, 114
- Monotropoideae, classification of, 105
- Monotropsis Lehmaniae*, 106; *odorata*, 105, 113, 115, 117; *Reynoldsiae*, 106; structure, 105
- Montagnites Candollei*, var. *texensis*, 119, fig. 120; elongation of the stipe of, 119
- Mt. Baker, Washington, Additions to the flora of, 236
- Muenschner, W. C., Additions to our knowledge of the flora of Mt. Baker, Washington, 236
- Muhlenbergia Emersleyi*, 8; *gracilis*, 10
- Mulgedium pulchellum*, 123
- Muller, C. H., New and otherwise noteworthy plants of the southwest, 152
- Mycelis muralis*, 125
- Notes and news, 47, 79, 103, 135, 175, 202, 240, 272
- Notholaena brachypoda*, 171
- Notices of publication: Anderson, Plants used by the Eskimo of the northern Bering Sea and arctic regions of Alaska, 204; Babcock, and Stebbins, American species of *Crepis*, 80; Brasfield, Tropical *Dacrymycetaceae*, 80; Broun, Index to North American Ferns, 136; Buchholz, The generic segregation of the *Sequoias*, 136; Constance, The genus *Eucrypta*, Nutt., 80; Conzatti, Flora Taxonomica Mexicana, 80; Cooper, Additions to the flora of Glacier Bay Monument, Alaska, 1935-36, 204; Cooper, A fourth expedition to Glacier Bay, Alaska, 204; Copeland, E. B., Genera *Hymenophyllacearum*, 136; Copeland, H. F., The *Styrax* of northern California, 80; Detling, Revision of the North American species of *Descurainia*, 204; Eastwood, Perennial lupines of the pacific states, 136; Elmer, Leaflets of Philippine Botany, 175; Epling, Revision of *Salvia*, subgenus *Calosphace*, 136; Featherly, Grasses of Oklahoma, 104; Foxworthy, Philippine *Dipterocarpaceae*, 135; Fulford, The *Cladoniae* of eastern Kentucky, 80; Hoover, Revision of the Genus *Brodiaea*, 204; Jepson, Flora of California, 136; Jones, Synopsis of the North American species of *Sorbus*, 80; Keck, Revision of *Horkelia* and *Ivesia*, 80; McMinn, Illustrated manual of California shrubs, 136; McVaugh, Some realignments in the genus *Nemacladus*, 204; Morton, Revision of *Besleria*, 136; Porsild, Contributions to the flora of Alaska, 204; Porsild, Flora of Little Diomed Island in Bering Strait, 204; Smith, Species *Lupinorum*, 104; Rollins, The cruciferous genus *Stanleya*, 136; Vaughn, Mexican involucrate trifoliums, 204; Wiggins, *Cheilanthes* in the Sonoran Desert and certain adjacent regions, 136; Wolf, North American species of *Rhamnus*, 80
- Nemophila*, 33
- Nerisyrenia camporum*, 130, 131, var. *angustifolia*, 131; *incana*, 130, 132; *linearifolia*, 130, 132
- Nevada, Charleston Mountains, Two species of *Draba* from, 127
- Newberrya, 114
- Nolina*, 137
- Nothoscordum fragrans*, 9
- Nyctelea*, 28

- Odontostomum, 138  
 Oenothera serrulata, 9  
 Onopordum Acanthium, 201  
 Ophioglossum Pringlei, 171  
 Opuntia Engelmannii, 7; imbricata, 5, 6; Kleiniae, 6; leptocaulis, 6; macrocentra, 5, 6, 7  
 Oregon, New thistle from, 97; Wallowa Mountains, two new Compositae from, 247  
 Ornithogalum divaricatum, 143  
 Orthocarpus erianthus var. laevis, 164; faucibarbatu, 164, subsp. typicus, 164, subsp. albidus, 164; floribundus, 165; Notes on, 164; pusillus, 165  
 Oryzopsis fimbriata, 8  
 Otis, Ira C., 98, pl. 99  
 Oxalis albicans, 11  
  
 Palafoxia linearis, 5  
 Panicum ferventicola, 92, 96, var. papillosum, 94, 96, var. sericeum, 93, 96; lanuginosum, 96; lasenianum, 95, 96; pacificum, 91, 96, 236; Realignment of group, 90; thermale, 91, 96  
 Parrasia, 130; camporum, 131; lineariafolia, 132  
 Parthenium incanum, 6  
 Peck, M. E., Two new Compositae from the Wallowa Mountains, Oregon, 247  
 Pennisetum Ruppelii, 79  
 Penstemon pulchellus, 10  
 Penthorum, 186, 190, 191; sedoides, 188  
 Persimmon, Mistletoe on, 272  
 Petalostemon oligophyllum, 9  
 Phalangium pomeridianum, 141  
 Phaseolus Metcalfei, 11  
 Phlebodium astrolepis, 171; Conzatti, 171; erythrolepis, 171; polylepis, 171  
 Phlox mesoleuca, 9  
 Pholistoma, 33  
 Phoradendron flavescens, 272; var. macrophyllum, 241; fig. 242; longispicum, 272; villosum, 245  
 Phylogenetic diagrams, figs. 209, 213  
 Phylogeny of the angiosperms, 209  
 Phymatodes angusta, 171; Palmeri, 171  
 Phytolacca americana, 79  
 Pinus apachea, 11; arizonica, 11; ayacahuite, 11; cembroides, 10, 11; chihuahuana, 11; Lumholtzii, 11; muricata, 248, pl. facing 248; pinceana, 11; Sabiniana, 72; strobiformis, 11; Torreyana, pl. 199, in cultivation, 198  
 Plantago mexicana, 9  
 Pleistocene record of Pseudotsuga macrocarpa, 233  
 Pleuricospora, 114  
 Pleuropogon refractum, 236  
 Poa stenantha, 236  
 Poecilopteris repanda, 171  
 Poliomintia incana, 5  
 Polypodium oaxacanum, 171  
 Populus tremuloides, 11  
 Porlieria angustifolia, 6  
 Potentilla emarginata, 237; Mexiae, 9  
 Proceedings of the California Botanical Society, 47, 175, 204, 273  
 Prosopis glandulosa, 5; glutinosa, 7  
 Pseudobahia, 251; bahiaefolia, 270; Heermannii, 270  
 Pseudotsuga macrocarpa, 233; fossil cone of, fig. 234; mucronata, 11; Pleistocene record of, 233  
 Protocoronospora nigricans, 241, 246; Phoradendri, 242, fig. 242; 246  
 Pteridium caudatum, 171  
 Pteris aquilina, 171; laciniata, 171  
 Pyrola, 116  
  
 Quercus, 178; agrifolia, 178, 180, fig. 181, pl. 183; arizonica, 10; chihuahuensis, 7, 9, 10; chichupensis, 10; dumosa, 157, var. Kinsela, 157; diversicolor, 11; durangensis, 10; durifolia, 11; Emoryi, 7, 8, 9, 10; epileuca, 9, 11; hypoleuca, 9, 10; incarnata, 11; pennivenia, 9, 11; santaclarensis, 8, 10; Sipuraca, 9  
 Quick, C. R., Ribes tularense in Sequoia National Park, 103  
  
 Ratibida columnaris, 9  
 Reed, Fred M., 163, fig. 163  
 Reed, H. S., Fred M. Reed, 163  
 Reseda luteola, 79  
 Reviews: Ammons, Manual of the liverworts of West Virginia, 238; Applegate, Plants of Crater Lake National Park, 171; Barkley, Keys to the phyla of Organisms, including keys to the orders of the plant kingdom, 172; Conzatti, Flora Taxonomica Mexicana, 170; Cooke, Flora of Mt. Shasta, 270; Fassett, Leguminous plants of Wisconsin, 101; Fassett, Manual of aquatic plants, 237; Fawcett, Flora of Riverside and vicinity, 102; Jaeger, Desert wild flowers, 239; Jones, Flowering plants and ferns of Mt. Rainier, 134; Marie-Victorin, Phytogeographical problems of eastern Canada, 78; McMinn, Illustrated manual of California

- shrubs, 183; Steere, Liverworts of southern Michigan, 202
- Rhamnus pinetorum*, 10
- Rhus choriophylla*, 6; *microphylla*, 7; *trilobata*, 10
- Ribes*, *binominatum*, 103; *tularensis* in Sequoia National Park, 103
- Riddelia Cooperi*, 5
- Robison, W., and C. Epling, *Pinus muricata* and *Cupressus Forbesii* in Baja California, 248
- Rollins, R. C., Notes on certain Cruciferae of Mexico and southwestern United States, 129
- Rossbach, G. B., and R. P., Southern occurrences of *Allium crenulatum* and *Meconella oregana*, 240
- Rosularia, 188, 190
- Salix*, 231; *laevigata*, 242; *melanopsis*, 237
- Salvia apiana*, 272; *carduacea*, 273; charts showing distribution of subgenus *Calospace*, 35, 36, 37; *eremostachya*, 272, 273; Occurrence in New World, 34; *Vaseyi*, 272, 273
- San Diego County, California, New records of alien plants in, 79
- Sarcodes*, 116
- Saurauia*, 116
- Saxifraga caespitosa*, 237; *saximontana*, 237
- Schkuhria Pringlei*, 11
- Schmoll, H. M., Realignment of *Panicum thermale* group, 90
- Schoenolirion album*, 137; *bracteosum*, 137
- Schreiber, B. O., Genus *Helianthemum* in California, 81; and A. E. Wieslander, Notes on genus *Arctostaphylos*, 38
- Schweinitzia caroliniana*, 105; *odorata*, 105; *Reynoldsiae*, 106
- Scilla pomeridiana*, 141
- Scirpus caespitosus*, 236
- Sclerocarpus exiguus*, 170; *gracilis*, 169, 170
- Scutellaria angustifolia*, 51, 63, 70, var. *canescens*, 66; *antirrhinoides*, 50, pl. 53, 61, 68, 70, var. *californica*, 58; *Austinae*, 51, pl. 53, 68, 70; *Bolanderi*, 50, pl. 53, 57, 68, subsp. *austromontana*, 58, 70, var. *californica*, 58, subsp. *typica*, 58; *Brittonii*, 51, 64, 68, 70, var. *virgulata*, 65; *californica*, 50, pl. 53, 58, 68, 70; *corollas*, size variation, fig. 71; distribution maps of, 59, 65, 70; *epilobiifolia*, 57; *Footiana*, 55; *galericulata*, 50, 57; *lateriflora*, 50, 51; leaf variation, fig. 69; *linearifolia*, 68; *nana*, 50, 55, 70; *nevadensis*, 61; *pilosiuscula*, 54; *sanhedrensis*, 61; *siphocampylodes*, 51, 66, 68, 70; *tuberosa*, 50, 52, subsp. *australis*, 52, 54, 70, subsp. *similis*, 52, 54, 70, var. *similis*, 54; *veronicaefolia*, 63; *viarum*, 61; *virgulata*, 65
- Scutellariae*, of Western North America, 49
- Sedella*, 187; *Congdoni*, 187, pl. 189, 190, 194; Further notes on the genus, 192; *leiocarpa*, 192, 194, fig. 195; *pentandra*, 187, pl. 189, 190, 194, fig. 195; *pumila*, 187, pl. 189, 190, 194, var. *Congdoni*, 187
- Sedum annuum*, 185, 186, pl. 189, 190; *Congdoni*, 187; *cymosum*, 190, var. *Smallii*, 186; *hispanicum*, 190; *Nevii*, 184; *Nuttallianum*, 185, pl. 189, 190; *pumilum*, 187, var. *Congdoni*, 187, 194; *pusillum*, 184, pl. 189; *stellatum*, 185, pl. 189
- Setchell, W. A., and Alaska Willows; 231, pl. facing 232
- Sequoia National Park, *Ribes tularensis* in, 103
- Sharsmith, C. W., Notes on *Draba* in the Sierra Nevada, 147
- Sharsmith, H. K., New species of *Cirsium* from California, 85; Further notes on the genus *Sedella*, 192
- Shreve, F., Observations on vegetation of Chihuahua, 1
- Sierra Nevada, *Draba* in, 147
- Silybum marianum*, 201
- Sisymbrium texanum*, 134; *orientale*, 79
- Sisyrinchium tenuifolium*, 9
- Smith, C. O., Observations on the elongation of the stipe of *Montagnites*, 119
- Sonchus pulchellus*, 123
- Southwest, New plants of, 152
- Sphaeralcea incana*, 5
- Sporobolus flexuosus*, 5
- Spotts, A. M., Violets of Colorado, 16
- Stanleyella texana*, 134
- Stebbins, G. L., Jr., Notes on *Lactuca* in Western North America, 123; Review; Phytogeographical problems of Eastern Canada, 78
- Stipa Pringlei*, 11
- Stockwell, W. P., Cone variation in Digger pine, 72
- Synthlipsis*, 130; *Berlandieri*, 134, var. *hispida*, 134; *Greggii* var. *hispidula*, 133, var. *typica*, 133; *heterochroma*, 134; *lepidota*, 133



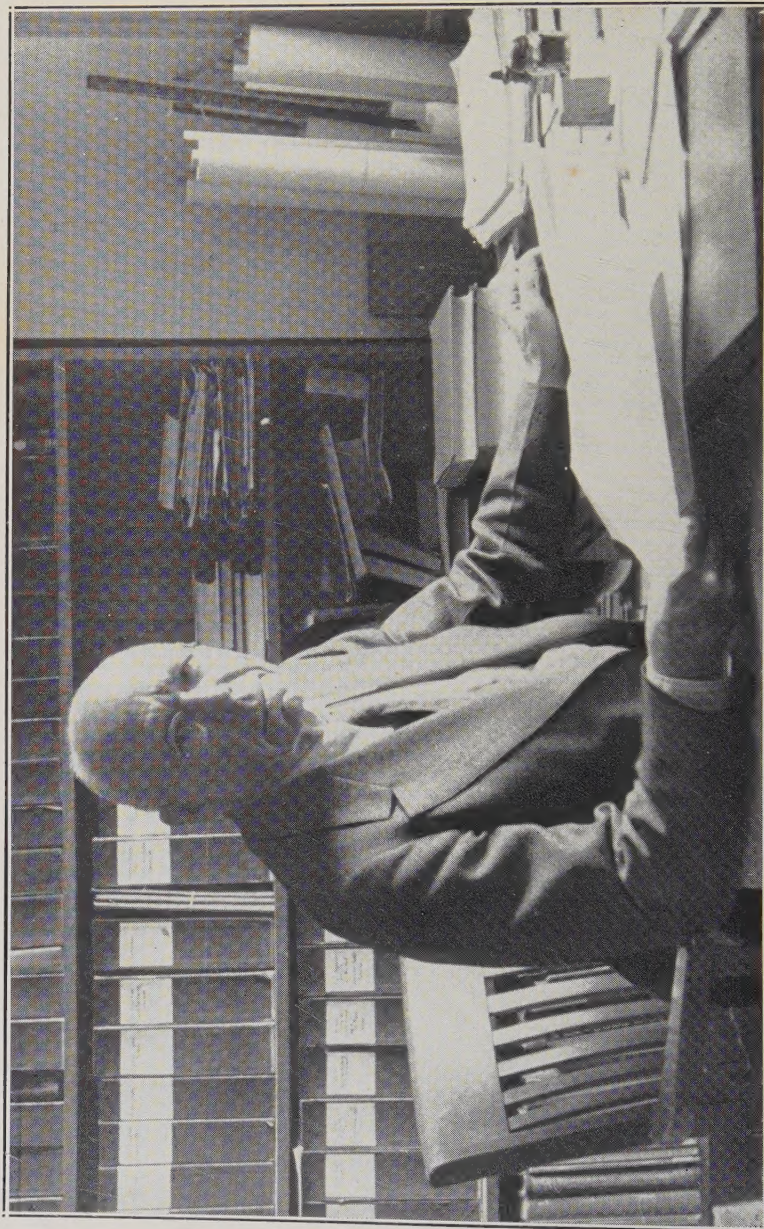
- Tagetes lucida*, 9  
*Taraxacum ceratophorum*, 237; *ovinum*, 248; *paucisquamosum*, 247  
*Tecoma Stans*, 7  
*Tetrorum*, 184  
*Teucrium glandulosum* in California and Arizona, 135  
*Tephrosia leucantha*, 11  
 Texas, Six thistles recently introduced into, 200  
*Thalictrum pinnatum*, 10  
*Thelosperma gracile*, 9  
*Thelocactus bicolor*, 6  
 Thistles, Six recently introduced into Texas, 200  
 Thompson, J. W., Ira C. Otis, 98, pl. 99  
*Tillaea*, 190; *cymosa*, 184  
*Tonestus eximius*, 168  
*Tradescantia crassifolia*, 11; *pinetorum*, 10  
*Tragia nepetifolia*, 9  
 Umbilicus, 188  
 United States, southwestern, Notes on certain Cruciferae of, 129  
*Verbena canescens*, 9  
*Vicia sativa*, 245  
*Vincetoxicum nummularium*, 9  
*Viola adunca*, 19, 26, subsp. *Ashtonae*, 26, subsp. *radicosa*, 26; *atriplicifolia*, 24; *bellidifolia*, 19, 25, subsp. *typica*, 223, subsp. *valida*, 223, pl. 225; *bicolor*, 23; *biflora*, 19, 23; *biternata*, 23; *Brainerdii*, 20; *canadensis*, 19, 27, var. *scopulorum*, 27; *cognata*, 22; *delphinifolia*, 19; *demissa*, 25; *erectifolia*, 24; *flavovirens*, 24; *gomphopetala*, 24; *inamoena*, 26; *lanceolata*, 219; *linguaefolia*, 19, 24; *McCabeiana*, 226, pl. 229; *montanensis*, 26; *neomexicana*, 27; *nephrophylla*, 19, 22; *Nuttallii*, 19, 25, var. *venosa*, 24; *ocellata*, 218; *odontophora*, 26; *palustris*, 19, 21, subsp. *brevipes*, 18, 21; *pedatifida*, 18, 19; *pratincta*, 19, 21; *pistils* of, pl. 227; *physalodes*, 25; *Rafinesquii*, 19, 23; *renifolia*, 18, 20; *retroscabra*, 26; *retusa*, 19, 22; *rugulosa*, 19, 26; *Rydbergii*, 26; *Sandbergii*, 21; *scopulorum*, 27; *Selkirkii*, 19, 20; *sempervirens*, 224, subsp. *orbiculoides*, 224, subsp. *typica*, 224; *Sheltonii*, 19, 23; *subvestita*, 26; *superba*, 220, pl. 221; *tenella*, 23; *Thorii*, 24; *uncinulata*, 224; *vallicola*, 19, 25; *venosa*, 19, 24  
 Violets, of Colorado, 16; Western, studies in, 218  
*Viscainoa geniculata*, 162; New species from Baja California, 161; *pinnata*, 161, 162  
*Viticella*, 28  
 Wallowa Mountains, Oregon, Two new Compositae from, 247  
 Washington, Mt. Baker, Additions to flora of, 236  
 Wieslander, A. E., and B. O. Schrieber, Notes on genus *Arctostaphylos*, 38  
 Wiggins, I. L., New species of *Eriogonum* from Baja California, 158  
 Wilson, A., *Pinus Torreyana* in cultivation, 198  
*Wirtgenia*, 116  
*Wislizenia refracta*, 5  
*Yucca elata*, 5; *macrocarpa*, 6

## ERRATA

- Page 7, line 34: for *Wislizeni* read *Wislizeni*.  
 Page 88, line 25: for *obispoensis* read *obispoense*.  
 Page 166, line 43: for *plerusque* read *plerisque*.  
 Page 167, line 14: for *typica* read *typicus*.  
 Page 200, line 35: for *picris* read *Picris*.







FRANCIS RAMALEY (see p. 260)

Frontispiece to Volume 6, MADROÑO.